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JULY, 1900.

CARBOLIC GANGRENE.

GANGRENE PRODUCED BY THE APPLICATION OF DILUTE SOLUTIONS OF
CARBOLIC ACID.*

BY FRANCIS B. HARRINGTON, M.D.,
VISITING SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

THAT dilute solutions of carbolic acid applied to the extremities for a number of hours may produce gangrene and total destruction of the part is a fact of which the public at large and even many physicians are ignorant. It is an unfortunate result of the popularization of the antiseptic treatment of wounds. Carbolic acid, once the favorite antiseptic among surgeons, and now discarded, has become a general household remedy for the treatment of slight wounds and bruises. During the last five years at the Massachusetts General Hospital I have discovered myself, or have seen through the courtesy of the out-patient surgeons, eighteen cases of gangrene from this cause. In a large proportion of these cases amputation has been necessary. These, together with cases which I can find in the medical literature of various countries, make a total of one hundred and thirty-two cases of gangrene from dilute solutions of carbolic acid. It would be safe to assume that many hundreds of fingers have been destroyed from this cause. Doubtless many cases occur and are not recognized as due to carbolic acid, and these with many others are never reported. Usually the patient has come to the hospital with the story of having treated a cut, a bruise, or a felon with a solution of carbolic acid which has been purchased from an apothecary for the purpose. Occasionally the treatment has been suggested by a physician.

* Read at the meeting of the Massachusetts Medical Society, June 12, 1900.

The facts are these: An aqueous solution of carbolic acid (1 to 5 per cent.), if applied to an extremity, as the fingers or toes, for a number of hours in the form of a moist dressing or poultice, may produce gangrene and total destruction of the part. This result is not from compression, but simply from the action of the carbolic acid.

The following history of a case illustrates the occurrence:

The patient came to the out-patient department of the Massachusetts General Hospital. A delicate girl, aged twenty-six years, cut the tip of her right index finger with a piece of tin. Her brother, a strong, healthy man, had treated a cut finger two weeks before with a solution of carbolic acid which he had bought from an apothecary. His cut healed quickly and without trouble of any sort. She adopted the same treatment, washed the finger with the same solution and put on a bandage which she saturated with the carbolic solution. This was 6 P.M. On going to bed she moistened the dressing again with the solution. There was some pain in the finger during the night. In the morning on removing the dressing the skin of the finger was gray in color and the finger felt "lifeless and heavy." It was somewhat swollen throughout and especially at the base. The color changed in a few hours to a dark brown. The discoloration was general, and extended nearly to the base of the finger, this being the limit of the bandage.

A poultice of flaxseed meal was applied. The numbness remained. When the finger was allowed to become dry it looked quite black. Various dressings of a soothing nature were applied.

At the end of four weeks, when I first saw the finger, it appeared to be in a condition of advanced gangrene. (See Plate I.) It was clay-colored in places, dark brown in some, and black in others. The nail appeared bluish-black. A well-marked "line of demarcation" had formed near the end of the first phalanx. The superficial tissues of the remainder of the phalanx were reddened and swollen. The finger was amputated at the middle of the first phalanx. Dr. William F. Whitney made the following report upon the microscopical appearance of this amputated finger:

"A transverse section was made completely through the finger after removal of the bone. This was mounted in celloidin and stained with polychrome methylene-blue and eosin. The skin and subcutaneous tissue stained diffusely with the exception of numerous large colonies of micrococci, which were found in the breaks on the surface and could be followed into the deeper layers. The vessels in this area were thrombosed, and colonies of bacteria were present in the blood-clot. Separating this from the deeper layer was a wide zone of round-cell infiltration, among which polynuclear leucocytes were present in large numbers. In places the tissue was liquefied, and there was a distinct formation of pus. From this to the periosteum there was a diffuse infiltration of round cells, and many of the small vessels were thrombosed, with areas of hemorrhage among the tissues.

"The process may be regarded as a total superficial necrosis with deeper purulent inflammation and hemorrhage." (See Plate II.)

This record is so like the history of other cases observed in the out-patient department of the Massachusetts General Hospital that a report of them would be a needless repetition.

PLATE I.

CARBOLIC GANGRENE.

Appearance of a finger four weeks after the application for twenty-four hours of a dilute solution of carbolic acid. The finger was wrapped in cloths which were saturated with the carbolic solution not stronger than five per cent. Amputation necessary. Inflammatory process at the base of the finger shown by the reddened tissues.

Microscopic appearance shown in Plate II

PLATE II.



A

B

C

CARBOLIC-ACID NECROSIS. Low power.

A. Area of total necrosis (diffuse red staining) with numerous colonies of micrococci (dark blue).

B. Area of purulent infiltration, diffuse finely granular blue staining from the large number of cells.

C. Area of round-cell infiltration. Fat and fibrous tissue with abundant cells and thrombosed vessels in outer zone.

See Plate I.

The history of the reported cases varies but little. The patient suffers from a wound or pain in the extremity, and by advice, sometimes unhappily, of a physician, sometimes of a friend, and often because of his own idea of the proper treatment of such conditions, he purchases from a pharmacist a solution of carbolic acid. The member is wrapped with a dressing saturated with the solution. If the solution is strong enough and the length of time of its application is long enough the result will be a loss of the part. It is sometimes impossible to determine the exact strength of the solution which has been used. It is safe to assume that it is not stronger than a 5 per cent. solution, since water, which is the common solvent, will take up only about 5 per cent. of the acid. Numerous cases (Lévai³³ and others) have been reported in which 3 per cent. and 2 per cent. solutions have caused gangrene which has resulted in amputation.

Péraire⁴¹ reports a case in a child of ten years, who lost the second and third joints of the finger after twenty-four hours of exposure to a compress saturated with a 1 per cent. solution of carbolic acid. It is therefore plain that any solution of carbolic acid between 1 and 5 per cent. is dangerous. It is needless to add that gangrene does not always follow the use of carbolic solutions in this manner. In the report of the case occurring at the Massachusetts General Hospital, which I have given in detail, I mentioned the fact that the brother of the girl who lost her finger by carbolic gangrene had previously used the same solution in the same manner with no bad effect. The result depends on the strength of the carbolic solution, the manner of application, the length of time of application, and the power of resistance of the individual.

The method of application usually employed is to wrap the finger or the toe in cloth and to saturate this with the solution. Usually, in the cases reported, these wrappings have been kept saturated for from twelve to twenty-four hours. It is probable that the strength of the solution has less to do with the unfortunate result than the length of the application and the thickness of the individual's epidermis. Women made up four-fifths of the cases appearing at the Massachusetts General Hospital.

The destructive effect of pure carbolic acid is generally recognized, and sufferers from the cause are now rarely seen, except as the result of accident. Moreover, the injury from pure carbolic acid is usually less serious than from weak solutions. The action of weak solutions is insidious. The injury is done without causing suffering. Strong carbolic acid, as Lévai³³ has pointed out, forms a scab which resists penetration of the carbolic into the deeper tissues, so that complete gangrene and destruction of an extremity are less likely to follow from the use of liquefied carbolic acid than from weak solutions.

The following experiment was made with the consent of the patient, an elderly woman, whose arm was to be amputated for sarcoma of the elbow :

Aqueous solutions of carbolic acid from 1 to 5 per cent. were applied to the fingers, which had been covered with gauze. The gauze was saturated, each finger with a different strength. Unfortunately for the result of the experiment, the gauze was not kept saturated through the night. When the compresses were removed they were found to be perfectly dry and the skin beneath them entirely unchanged. There was not the least maceration of the skin, nor any apparent difference in the appearance of either finger. Had the compresses been kept moist throughout the night it is probable that a certain amount of gangrene would have resulted. The maceration of the skin which results from the moist application is a very important element in allowing the penetration of carbolic acid. It might be expected that a thick epidermis would withstand the action of carbolic solutions longer than a delicate one.

In 1871 Tillaux⁵⁵ reported three cases of carbolic gangrene. In 1877 J. D. Kellock²⁵ reported two cases in the *Canada Lancet*. Since that time medical writers in various countries have reported cases and called attention to the danger of the use of carbolic solutions. In 1888 M. Kortum²⁷ thought that the gangrene was produced by the action of the carbolic acid upon the trophic and vascular nerves of the part. In 1890 Frankenburg¹⁴ by experiments upon animals, proved that dilute solutions of carbolic acid would produce complete destruction of the parts to which they were applied.

As a result of microscopical study of the tissues he concluded that the carbolic acid acted directly upon the red and white corpuscles of the blood, producing stasis and thrombosis, thereby preventing all nutrition, and that this condition produced death in the parts. He thought that the effect upon the nerves was of minor importance.

In 1896 Josef Lévai²⁸ reported twelve cases of carbolic gangrene, the result of dilute solutions, observed by himself, and mentions fourteen other cases which he had seen resulting from strong carbolic acid. He collected reports of forty-two cases of carbolic gangrene. His observations led him to doubt the theories of Kortum²⁷ and of Frankenburg,¹⁴ that the gangrene was produced by the peculiar action of carbolic acid upon the nerves or upon the bloodvessels. By a series of careful experiments he shows that the death of the part is due to a direct chemical action on all parts of the tissues. He shows that carbolic acid has no specific quality for the production of gangrene, but that other diluted chemicals might produce the same effect. Five per cent. solutions of muriatic acid, nitric acid, sulphuric acid, acetic acid, and of caustic potash produced gangrene as well as carbolic acid when applied to an extremity by a moistened compress for twenty to twenty-four hours.

PLATE III.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 7.



FIG. 1. Thumb after the use of a dilute solution of carbolic acid. Amputation necessary. Thumb was scored in the attempt to save it. Case of Dr. C. L. Scudder.

FIG. 2. Appearance of finger of a young woman twenty-five days after the use of a dilute solution of carbolic acid.

FIG. 3. Appearance of a finger twenty-seven days after treatment with a dilute solution of carbolic acid for a crush of the last phalanx. The solution had been purchased from an apothecary who said it was five per cent. Amputation at the end of the first phalanx. Case of Dr. C. A. Porter.

FIG. 4. Result of the use of a weak carbolic-acid solution for a felon. After a number of weeks the last phalanx dropped off, leaving the above appearance. Case of Dr. Scudder.

FIG. 5. Finger after the use of dilute solution of carbolic acid for slight injury. Amputation necessary at line of demarcation.

FIG. 6. Same as Fig. 2 after amputation

FIG. 7. Appearance of finger three weeks after the use of a weak solution of carbolic acid for paronychia. Amputation necessary.

“ The histological examination shows that in the beginning each of the diluted chemicals applied in the form of a moist dressing produces the same effect : the epithelial layer becomes œdematous and loosened.”

“ As soon as a way has been made to the deeper layers each agent produces in a different way the same result, namely, necrosis of the living tissues.” The death of the part takes place in layers downward, and affects not only the nerves and vessels, but all the tissues at the same time. Maceration of the skin having taken place, as a result of prolonged action of the watery solution, the penetration of the chemical becomes easy and rapid.

Experiments and observations show that the gangrene does not result primarily from tight bandages, although tight bandaging undoubtedly increases the tendency to this process. The gangrene is limited to the parts enveloped by the moist compress, for in some cases, as mentioned by Lévai,³³ the last phalanx of the finger when not covered by the dressing has escaped and may continue to have its natural appearance and to bleed when pricked for some time, when the finger nearer the trunk may be quite black and without sensation. The gangrenous process may sometimes be so slight that only the skin is destroyed. Dr. C. A. Porter was able in such a case to save in part the usefulness of a finger by skin grafting before cicatrization took place. The treatment of this condition must vary according to severity of the process. In many cases it soon becomes evident that amputation will be the only helpful treatment. If the process seems superficial and the case is seen soon after the removal of the carbolic dressing it might be beneficial to apply a dressing saturated with a bland alkaline solution such as lime-water.

It has been asked why gangrene does not occur upon the trunk. Superficial gangrene does occur if the application is sufficiently prolonged and the saturation of dressings is great enough. The result is not so disastrous because of the greater thickness of tissues and because the blood-supply cannot be shut off as it is in an extremity. It is the enveloping of the entire part, as a finger or toe, with the dressing which causes the complete destruction of the part, since the gangrene only affects those parts which are thus covered.

The public must be taught to use some safer treatment. Moist dressings are often very soothing and helpful in slight injuries of the fingers or toes. A large part of the benefit to be derived from any form of moist dressing can be obtained by using boiled water on clean compresses. Safe household remedies for this purpose are tincture of hamamelis or solutions of borax or of boric acid.

It is evident that carbolic acid solutions in any strength applied as a moist dressing is dangerous and ought never to be used. The fact that it is often used without bad results renders it the more dangerous. It

is the duty of the medical profession to see that this needless destruction of fingers is stopped. Carbolic acid of any strength should be included in the list of those drugs which can only be procured by a physician's prescription. Whatever the strength, it should always be labelled as dangerous.

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REPORT OF THE COMMITTEE OF THE AMERICAN SURGICAL ASSOCIATION ON THE MEDICO-LEGAL RELATIONS OF THE X-RAYS.¹

GENTLEMEN: At the meeting in 1897, in a paper on the "Röntgen Rays in Surgery," the chairman of this committee made the following remarks:

"Before leaving the subject of fractures it may be well to present for discussion a few questions having a medico-legal bearing, even although it may not be possible at present to answer them finally.

"We may begin by asking whether skiagraphy has as yet given us a better understanding of fractures in general or has been the means of suggesting more efficient treatment.

"It is difficult, in reply, to point to any one definite addition to our knowledge of these injuries, and so far as I know no material modification of the general rules governing the treatment either of fractures generally or of any specific fracture has as yet resulted; but in individual cases, such as have been described above, it has certainly been of great utility, and is likely to become more valuable as technique improves and experience increases.

"The question whether or not the patient has the right to demand, as ordinary care, that the medical attendant should have a skiagraph of the fracture taken, I would at this time unhesitatingly answer in the negative. Until a much larger number of cases have been observed, and the pictures and the clinical results have been compared, the routine use of skiagraphy might be more harmful than useful.

¹ Read by the Chairman of the Committee, Dr. J. William White, of Philadelphia, at the meeting, May, 1900.

"There can be no doubt, however, that skiagraphs will figure largely in suits for damages after accidents and in cases of alleged malpractice. They have already been admitted as evidence in such cases, and it is probable that juries will with increasing frequency have to decide whether to place greater weight on deformity as shown by skiagraphs or on expert evidence as to the absence of genuine disability. It seems obvious that each case must be studied by itself, but that it would be injudicious, if not altogether unwarranted, for us to assume at present that clinical experience and the judgment based upon it should be subordinated to the pictorial testimony of the skiagraph.

"It is not, however, too soon to advise that in all obscure, complicated, and unusually difficult cases the help afforded by the Röntgen rays shall be secured by the surgeon, even if it is done chiefly with a view to his own protection.

"As time goes on it is probable that we shall be better able to estimate accurately the precise clinical value of minor deformities. In the meantime it seems to me we should be careful to avoid the setting up of an impossible ideal as a standard in fracture cases."

In the discussion that followed Dr. Fowler said: "With regard to malpractice suits, a lady recently came to me with a skiagraph of a part of her forearm, wrist, and hand, showing apparently a most deplorable deformity as the result of a Colles' fracture. The picture had been taken for her at one of the X-ray studios conducted by a lay combination of electrician and photographer. She considered the case one of gross malpractice, and threatened suit against the practitioner who had treated it. In reality the deformity was nothing like as great as the picture showed. I found that I could put her well arm in such a position with relation to the plate as to produce a greater deformity than that which it was claimed existed in the injured arm. I was also able to place the hand that was deformed in such a position that the bones appeared almost normal in the picture. These X-ray suits are likely to become sources of annoyance and even financial loss to surgeons. Personal damage lawyers will enter into collusion with those in charge of the X-ray studios, and patients who from curiosity or other motives apply for skiagraphs of fractures will be encouraged to institute legal proceedings to recover damages for alleged improper treatment."

Dr. Richardson said: "I have talked the medico-legal side of this question over with several of our judges, and some of them are going to admit these skiagraphs. The important point is how you can tell that the skiagraphs are accurate, and this is a very difficult matter. In many cases it will be absolutely impossible for us to say that there is no fracture. I could not detect any in one case, but there was one. We could not bring up a more important subject at this time, and the question is as to the position the surgeon should assume when he meets with fractures

and dislocations. A great deal of trouble is going to result from these pictures. If it is true that they are not accurate, and that fractures are shown when none exist, then they cannot be relied upon in diagnosis."

Dr. Weist then made the suggestion that a committee be appointed "to formulate an opinion as to the reliability of skiagraphs," and the result was the formation of this committee on "The Medico-legal Relations of the X-rays."

Since then I have written annually to all the members of this Association, asking that they aid the committee in securing definite evidence as to the reliability—or more especially the unreliability—of X-ray pictures in various forms of disease or injury.

In February, 1899, the following circular letter was sent to every member of the Association :

DEAR DOCTOR : I am chairman of the committee appointed in 1897 to report to the American Surgical Association upon the medico-legal value of the X-rays. In the printed report of the minutes of the nineteenth meeting, held in April, 1898, page 343, will be found a provisional communication asking particularly that all Fellows of the Association would have the kindness to send our committee any examples of cases of X-ray examinations which have been deceptive or misleading as to their practical value. We have had absolutely no response to this request. We venture, therefore, to ask you directly if you can help us in securing material upon which to base a report which may at least be the subject for discussion.

We should be glad if you would answer categorically the following questions :

1. Have you found skiagraphy reliable in the diagnosis of (a) fractures attended with so much swelling of surrounding tissues that satisfactory palpation of the fragments is impossible? (b) Fractures about joints? (c) Epiphyseal separations? (d) Fracture of the neck of the femur? (e) Ununited fractures? If in any of the cases belonging to one or the other of these classes the skiagraph was misleading, we would like particularly to have a print of it and the clinical history of the case.

2. Have you any reliable cases of recognition of (a) fracture of the base of the skull? (b) Fracture or dislocation of the vertebræ? (c) Fracture of the sternum, scapula, clavicle, or pelvis?

3. Do you know of any cases in which the testimony of the skiagraph in cases of supposed foreign bodies in tissues, or of tumors, gallstones, or kidney stones, has led to ineffective or mistaken operations?

There is much collateral evidence which could be asked for, but which it is the hope of the committee will be developed during the discussion. The immediate object of the committee is to determine if possible to what extent the testimony of the skiagraph may be relied upon either as a basis for treatment (especially in fractures) or as evidence for or against practitioners in suits for malpractice. As we are trying to do this work in the interest of the profession generally, we hope that you will aid us as far as possible.

Yours very truly,

J. WILLIAM WHITE,

Chairman.

The replies to question No. 1 were uniformly in the affirmative, except as to item (*d*), which refers to the neck of the femur. As to that, with but one exception, the replies were negative.

As to question No. 2, they are almost as uniformly in the negative.

Question No. 3 was answered negatively by twelve and affirmatively by six.

In other words, the large majority of the surgeons who replied at all to the communication had found the skiagraph satisfactory in fractures with great swelling, fractures about joints, epiphyseal separations and ununited fractures, but not in fractures of the femoral neck. The same number had not had reliable pictures of fractures of the base of the skull, of the spine, of the pelvis, sternum, or scapula. A few had used it in cases of fracture of the clavicle, but there it is obviously rarely necessary.

The answers to the third question vary, as during the time of the correspondence rapid improvement was made in the technique, and renal calculus became fairly easily recognizable; of course, it was not likely that many cases of mistakes as to supposed foreign bodies in the tissue would occur, but the cases recorded later serve as a warning as to the possibility of such mistakes.

The material procured in this way did not yet appear to justify definite conclusions, and at the meeting last year the following report was presented:

The Committee on the Medico-legal Relations of the X-rays begs to report progress, and respectfully asks to be continued. The committee feels that the position taken finally on this question by this Association should rest upon the broadest possible foundation. The evidence now available is insufficient for the purpose of drawing general conclusions which may serve as a safe guide to both the medical and legal professions in appropriate cases. While the value of the X-rays in surgery and even in medicine is obviously increasing, it is equally apparent that with their more extended use the opportunities for misinterpretation are also multiplying. It is most important that we should be able to state and to illustrate at least the most common examples of conditions under which the evidence offered by the X-rays may be unreliable.

The committee once more begs the members of the Association to aid it by supplying carefully observed and recorded personal cases with negatives or prints, and by calling attention to any others that may be useful in this relation.

Since then, with one or two exceptions, no communication has been received from any member of the Association. These prefatory remarks seem necessary, because the matter still appears to the chairman of your committee to be one that may at any time become acutely and vitally important to any practising surgeon; because so far as he knows this will be the first body of prominence to take formal action on the subject; and because such action should be so well considered and well

grounded as to serve as a guide to both the legal and the medical professions in the immediate future.

In fairness to skiagraphy itself as a surgical aid, it should be stated in advance that many of the errors of which examples are cited in this report are avoidable ; that the habit of taking more than one plate and of comparing with plates from the normal region corresponding will lessen them when it is systematically adopted ; and that there is no disposition on the part of the committee to deny or disparage the great usefulness of skiagraphs in surgery.

But usefulness and infallibility are not identical. In a thing which purports to be a representation analogous to a photograph, showing only what exists and nothing else, the claim of infallibility, of exact accuracy, is sure to be made by some lawyers and listened to approvingly by some judges and juries. Your committee believes that the time for such an attitude has not arrived, and that the facts now before the profession, some of which are herewith presented, justify this conclusion.

In trying to systematize the material bearing on this subject it has seemed well to classify the evidence, which goes to show :

1. That there have already been cases of improper use of the skiagraph in court.
2. That there is real danger for the future from the teaching of some of the profession who have not preserved a judicial mental attitude, but have been led by the many and undoubted advantages of skiagraphy to exalt it beyond its present merits.
3. That important mistakes have been made in reference to (a) fractures, (b) foreign bodies, (c) renal calculi.
4. That suits for damages on account of X-ray burns and their consequences are now occurring, and that surgeons may suffer thereby even if not the actual skiagraphers.
5. That to counterbalance the extremists, many of the profession have individually called attention to the fallacies of skiagraphers and to the danger of their use as medico-legal evidence.

1. As to the first question, it is scarcely necessary for the committee to spend much time in proving that the dangers of the improper use of the skiagraph in medico-legal cases is not imaginary, but a few illustrative cases may be cited.

In a case in Providence, R. I., the testimony of the skiagrapher was accepted by the court as final and conclusive evidence that a Colles' and a Barton's fracture had existed in the case of the plaintiff. The suit was therefore dismissed.

The *American X-ray Journal*, May, 1899, comments editorially upon the case as follows :

“ If the physician understands anatomy and radiography very well he can at will distort a normal joint in a picture, or favorably present

character of which cannot be established beyond a doubt ; but much more has been shown to us by these rays. A glance at the fluoroscope not only gives one an idea of the special type of the fracture, but the situation, shape, and the number of the fragments and their correlation can be clearly ascertained. The photographic plate fixes the details of the fracture exactly, and permits of the thorough study of the various features of the fracture type. Its comparison with the normal skeleton makes the abnormalities evident at once, so the use of anæsthetics, which in many cases are not at all advantageous for the patient's physical condition, is no longer required in diagnosis. It is clearly seen that the advent of the Röntgen rays has accomplished no less than a revolution in the understanding of fractures."

In dealing with special fractures, he says in regard to impacted fractures of the neck of the femur that it may resemble contusion, and adds : " In such cases elucidation by the Röntgen rays is urgently required ;" but makes no mention of the general unsatisfactory character of skiagraphs of this region. It is noteworthy that in regard to this particular fracture fifteen Fellows of this Association out of those who replied to that question in the circular letter stated that they had not used the process in cases involving the neck of the femur. There is a good reason for this, of course. The information derived from a good skiagraphic picture, properly interpreted, would unquestionably be of great value in many cases. But the difficulties are very great. Mr. Muirhead Little (*British Medical Journal*, May 20, 1899) says :

" In no part of the body are mistakes more likely to be made than in considering skiagraphs of the pelvis and hips. At the Congress of the German Society of Surgery at Berlin in April, 1898, Hofmeister showed a number of skiagraphs of one normal pelvis from various points of view which gave various false appearances of deformity of the pelvis and femurs."

Mr. Little then figures in an extremely instructive illustration the varying forms of the images that can be produced of the head and neck of the normal femur by various relative positions of focus, tube, skeleton, and plate, showing at a glance that many deformities can be imitated and that the angle of the femoral neck, its thickness, its outlines, the size and relations of the condyles, the size and shape of the head of the bone, can all be made to vary so that coxa vara, osteo-arthritis, union after fracture with deformity, can easily be simulated. In the paper above mentioned, Hofmeister stated that the angle of the neck with the shaft of the normal femur might be made to appear as small as 90° by alterations of the relative positions of light, plate, and skeleton.

Infinitely more work must evidently be done before the diagnosis of injury and disease in this region can rest surely and safely on skiagraphy.

In reply to one of the questions in the circular letter seventeen Fellows

said that they had had no reliable cases of fracture or dislocation of the vertebræ.

Yet the writer already quoted from, writing on fractures of the spine, says that "with the aid of the Röntgen rays the type of the fracture and the size and number of the splinters and their location can be so well represented that the indications for the mode of treatment are set forth clearly. If there is only slight angular displacement reduction can nearly always be accomplished; but in the event of intraspinal hemorrhage, and when bone fragments, driven into the canal, press upon the cord, operative interference is required."

He also says that "under the application of the Röntgen rays the results of operation, which formerly had been confined to exploration, became much more encouraging. The field of operation being outlined by the skiagraph, the *modus operandi* could be determined before operation. While at one time it was deemed advisable to expose a large portion of the spinal column in order to ascertain that every possible injury had really been reached, now all the operative procedures can be carried out under the indication of the rays with ease and security, even the length of the incision necessary for the removal of bone-splinters being shown by the skiagraph."

In an otherwise excellent chapter on the "Röntgen Ray in Relation to Fractures," contributed by Dr. E. A. Codman to Dr. Scudder's admirable work on the *Treatment of Fractures*, the former says: "A diagnosis of fracture without skiagraphs is always open to doubt, while with a careful X-ray examination there is seldom a doubt." He concludes, however, by saying:

"This chapter has been mainly devoted to warnings of the dangers of the Röntgen rays, and may in a measure discourage practitioners from its use. It should be stated, however, that when the limits of error are kept clearly in mind the actual value of the discovery to surgical science is very great. When there is doubt of the detailed diagnosis of a fracture no physician has done his full duty by his patient if he can command skiagraphic examination and has not used it. This is particularly true in medico-legal cases where there is a question of liability."

Similar evidence of the disposition to rest implicitly upon supposititious X-ray evidence is easily obtainable.

Dr. J. B. Roberts writes:

"Attention is called to the danger of relying too absolutely upon the appearances in skiagraphs, because of a recent article in a medical journal published in an important medical centre of the United States. A professor of surgery in one of the medical schools of that city makes the unexpected statement that in forty-four cases of fracture of the lower end of the radius which were skiagraphed nineteen showed that 'a distinct transverse fissure above the capitulum ulnæ existed without caus-

ing any apparent symptoms.' He then proves his assertion by printing several skiagraphic pictures of the lower end of the forearm which show a white line running more or less transversely across the lower end of the ulna. In one case, he says, five days after the injury, the patient was shown to an audience of about one hundred physicians. No one of these was able to recognize the ulnar fracture by examination of the patient, in whom there was, according to the author, no visible deformity at the seat of the ulnar fracture. It is curious that neither the professor himself nor his one hundred colleagues recognized the supposed line of fracture as the unossified epiphyseal cartilage normally present in children and young adults. This criticism is made because the unfortunate error of the author may lead to erroneous deductions and conclusions on the part of those who read his article."

Dr. F. W. Ross, acting assistant surgeon, U. S. A., says (*American X-ray Journal*, January, 1899):

"While the use of the X-ray is of inestimable value to us in making diagnoses, it is not an unmixed personal good, as we well know from actual experience.

"If it increases our diagnostic ability it also increases our responsibilities, and we are more exposed to suits for malpractice in fractures, particularly if deformity exists and we have not used it as a means of diagnosis, also in dressing and examination after reduction. I use it in all cases of fracture after splints and bandages are adjusted. *Negligence will be claimed for failure to use it in all cases where bad results follow.* If we have used this means we are strongly fortified."

Dr. A. V. L. Brokaw makes the following remarks on "The X-ray Diagnosis in Children: "

"The text-books of surgery and anatomy will necessarily, in part, require to be rewritten, owing to the revelations at variance with past teaching and ideas. The excuse that the conditions in a fracture-dislocation about the elbow cannot be determined, by reason of great swelling of the soft parts, will not in the future prevail. An examination with the fluoroscope, or the positive evidence of a radiogram, will establish with certainty the conditions present and enable the attendant to make a prognosis as to the future of the joint, thereby protecting in a measure the attendant from the all too frequent suits."

The *American X-ray Journal*, February, 1899, says, apropos of the necessary distortion seen in X-ray pictures, that unless this distortion is corrected the skiagraph is not true, and is therefore dangerous evidence to the operator, and also in courts of law; but it adds, however: "The Dennis fluorometer will correct these distortions with mathematical accuracy. No operator can conscientiously do surgery without this evidence, and the time is not far distant when this knowledge in medico-legal cases will be put to the severest test."

In the same number an ordinary case of fracture of the femur is figured, there being some overlapping, amounting, it is said, to about an inch. After complimenting the "eminent radiographer" who took the picture, publishing his portrait, and mentioning the fact that he is called upon far and wide for assistance, it adds that the case "is an able argument in favor of the universal use of the X-ray in fractures. Certainly no surgeon can be safe in setting fractures or dislocations without the aid of the human eye looking directly upon the site of injury."

3. (a) The members of this Association write as follows regarding the general subject of the value of the X-rays in fractures:

"My experience in fractures has been too limited to pass judgment. Unfortunately in the case that I found especially obscure, the ray only suggested a solution without clearly defining the difficulty. This I was obliged to lay to the charge of the artist and not to the ray. Thus far I have not derived material benefit from its use in fractures, as my ability to determine the condition without its help had more weight than the obscure shadow picture."—Oscar H. Allis.

"I believe the X-ray as a witness in suits does mislead. I saw a picture of Colles' fracture—a second break—which was misleading."—David W. Cheever.

"I cannot say that I have derived great assistance (diagnostic) in the cases included in question. I have found that the clinical result was in some cases far better than the position of the bones as shown by the X-ray picture would lead one to expect. My examinations of the pelvis and vertebræ have shown little, for the pictures have been too indistinct."—H. W. Cushing.

"One of the strikingly misleading features of a skiagraph is the apparent compared with the positive results as to deformation in deformities of the ankle-joint. Given a case of fracture near the ankle-joint, with marked deformity, which is corrected under an anæsthetic and by operation, if necessary, frequently the skiagraph, which is supposed to record the end result, will give a marked amount of deformity which is entirely misleading as to the functional result."—Herbert L. Burrell.

"It is probable that in not a few cases in which an excellent functional result is obtained the bones are not in an ideally perfect apposition. A fracture may even exist without the X-rays showing the slightest evidence of it. In a case of osteotomy performed by Dr. W. J. Taylor and skiagraphed through the dressings and a woollen splint the day after operation, no evidence whatever was shown of a fracture which was known to be absolutely complete and only one day old. Such a case should make us very careful in giving too positive testimony even from skiagraphs."—W. W. Keen.

"In answer to your first question I can only say that in general I have

found skiagraphy valuable in giving me a clearer understanding of some cases of fractures, as, for example, in cases where deformity, perhaps not carefully enough looked for, was shown. I have, however, also found at times that the deformity, which I felt sure by other means of examination existed, did not seem to be very markedly exhibited by the skiagraphic picture. This was probably due to the skiagraph not being taken in the line to best show the deformity.

“ I recall, however, one case of supposed dislocation of the femur which the skiagraph proved to me to be a fracture; the evidence of the skiagraph was very valuable, as it prevented unnecessary attempts to take reduction.

“ In some cases of ununited fracture the information given has been satisfactory, although I recall one case where union took place in which the skiagraphic picture seemed to give evidence that the separation was too great to allow such a result.

“ In reply to question 2, I can only say that I remember seeing a skiagraph in the hands of a friend which proved the existence of an unexpected fracture of the pelvis.”—J. B. Roberts.

“ (a) Have no experience in this class of cases. (b) I have had at least three examples in my practice of deceptive skiagraphs of fractures. 1. Fracture of os calcis with perfectly well-defined crepitus and motion between the two fragments. The skiagraph failed to show any clearly recognizable fracture, although the print was clear and of good definition. 2. Failure to show a perfectly well-marked fracture of the patella with considerable separation of the fragments. 3. Fracture of distal end of radius in which two pictures placed the fracture at different points and showed marked variation of direction and extent of it.”—F. S. Watson.

The following additional evidence may be cited :

Dr. Carl Beck (*New York Medical Journal*, January 6, 1900) reports the case of a boy, four years of age, who, while playing on the street, fell against an iron bar. “ Being unable to rise again, he was taken up and carried to St. Mark’s Hospital, where in the first instance moderate pain was noticed besides the functional disturbance in the left leg. There was neither any difference in level nor any deformity, nor any shortening, nor the typical equinus position. As shown from a photograph taken two days after the injury, there was only a very moderate and uniform swelling of the leg. Abnormal mobility and crepitus could be produced only by very rough manipulations. On the day following the injury two skiagraphs were made in different positions: one of them in the dorsal and the other in the lateral position. To my surprise, a skiagram made by direct irradiation, the centre of the platinum disk of the tube being perpendicular to the anterior surface of the leg, did not show the slightest indication of a fracture, while the

other, which represents the leg irradiated from the lateral outer aspect of the tibia, showed a marked fracture line. A third irradiation made on the fifth day after the injury, in the same position as in the dorsal skiagram, also showed the presence of a fracture beyond doubt. The patient was discharged, cured, five weeks after the injury."

Dr. W. J. Dodd, of Massachusetts General Hospital, writes me: "Of course, as you well know, we cannot overlook the fact that sometimes there is so little displacement that the skiagraph does not show fracture. We have had several cases where the surgeon made out fracture, yet the skiagraph did not show it; this was not because of poor plates, but because there was no displacement, and it was necessary to make deformity by rotation or force in order to make it apparent on the screen or plate, or else take the plate in different positions. I state this simply to show that oftentimes more can be ascertained by manipulation than by one plate. In such cases I think fluoroscopic examination is oftentimes more satisfactory, except, of course, in dense parts of the body. In fractures about joints the results have been very satisfactory, except about elbow-joints, where oftentimes it is so difficult to get an arm in suitable position. I think we have had more difficulty and less satisfaction with the elbow than with any other joint.

"We have had seven cases showing fracture of the neck of the femur, three of these were not recognized as such. Of course it is somewhat difficult to get a very sharp skiagram of that part of the body, still in all seven cases we succeeded in getting fair plates, sufficiently clear to enable the surgeon to make out fracture. Two of these were impacted. Impaction was not demonstrated clinically."

Dr. Harvey Reed reports and figures (*Journal of the American Medical Association*, April 30, 1898) a case in which an extraordinary degree of deformity in the bones and the leg is shown and is contrasted with a very satisfactory clinical recovery. He adds: "If this radiograph should be taken into court and submitted to a jury without taking into consideration the facts in the case, it would certainly be very misleading and would indicate a much worse condition of the limb than the clinical facts in the case would warrant. This shows seven distinct fractures of the bone, and yet with all that we have only two inches more shortening than existed in a previous fracture of the same limb.

"In another case there was a fracture of the tibia at about the middle of the lower third, and a fracture of the fibula at the upper part of the upper third, with a sliver of bone broken off the tibia at or near the point of fracture. This sliver could be freely moved up or down, and though the radiograph fails to show its presence, it undoubtedly existed, and notwithstanding we had two oblique fractures this patient got well with less than an inch of shortening, but if we were guided by this skiagraph we might think that the adjustment of these bones

was not as perfect as it might have been, and that there was a deformity of considerable magnitude. On the contrary, the man was young and healthy, with no injury of the soft parts, and we were enabled to put on extension and counter-extension, which was followed by a plaster-of-Paris cast after the œdema had subsided, and almost a perfect result was obtained as far as the clinical features of the case were concerned."

In the discussion which followed Dr. Reed's paper, Dr. Grant, of Denver, remarked that "unless the surgeon in treating a patient in a case of malpractice can show that he has treated him in accordance with that experience which is embodied in the ordinary text-books of his profession, and the patient is dissatisfied, he is liable in pecuniary damages to his patient. If he should accept the teaching of the X-ray in any case, and his results were not satisfactory, he would be liable for damages. The X-ray can be made a dangerous instrument as well as an aid to the surgeon, and if the profession treats it as it usually does everything new it will prove an instrument of danger. It will be an expensive thing for the surgeon."

(b) As to foreign bodies, the members of the Association have written as follows:

"In one case of supposed headless pin in the œsophagus a defective plate was rather deceptive. There was a scratch on the glass under the gelatin exactly where one would expect to find the pin. The scratch was not on the surface of the gelatin, and could not be seen by looking at the latter sideways so as to reflect the light from the surface. If this test had been present the error would have been more easily detected. The diagnosis was made by observing the irregular margin of the supposed shadow of the pin—a real pin would have given a clear-cut shadow. No operation was performed, of course, and the pin passed per anus."—B. Farquhar Curtis.

"In regard to foreign bodies, as to ineffective or mistaken operations, I recall only one case, that of a policeman, who was shot in the right thigh about one inch below the small trochanter; the scrotum was filled with blood. Fluoroscopic examination showed what appeared to be a bullet embedded in the testicle. At operation a diseased condition of the testicle was found, but no bullet. The bullet was located finally in the left leg about six inches below the small trochanter, and was removed."—Dr. W. J. Dodd.

"I myself had a case of bullet wound of several weeks' standing (the bullet lodged in the anterior part of the thigh under the rectus muscle), in which the bullet was located by X-rays several inches away from where it actually was. Some bits of clothing, coagulated blood, etc., made the shadow which was supposed to be the bullet."—W. L. Estes.

"The case misleading I have met with was one where a needle had

entered the heel. Apparently it was located by the X-ray, but when cut in upon could not be found. This case was twice operated on—once by myself and once by Dr. James Burry, of this city, each time ineffectually.”—Christian Fenger.

“In reply to your letter of February 3d, would say that my only valuable personal experience with the X-ray in diagnosis of fracture is one in which the differential diagnosis was made between a fracture and a dislocation of the hip, thereby preventing a threatened suit for malpractice against a worthy country practitioner.

“Yesterday an ineffective operation was performed at Asbury Hospital, of Minneapolis, by a very competent surgeon. The skiagraph showed an open safety pin in the trachea just below the third ring. An opening and thorough search in both trachea and œsophagus failed to reach the pin.

“I know of two cases expected to come before the courts of this State in the near future in which the plaintiff sues for damages on account of burns from the X-ray.”—J. E. Moore.

“In a very troublesome case of fracture of both radius and ulna near the wrist, with bad apposition, and where one of the bones was wired, the skiagraph seemed to show that the wire did not pass through the fragments.”—John Owens.

“One of the most instructive cases of the errors likely to arise in connection with skiagraphs that I have seen, was that of a needle in the foot of a patient where it had been for six months, and of which I had two sets of skiagraphs taken at intervals of a few days, the patient being in bed all the time, and the foot remaining undisturbed in this interval also; consequently there was no chance for the needle to have been actually moved. . . . I failed wholly to find it on the first attempt, at which time I followed the indications furnished by the first set of views. A week later I tried again and found it, but not in the spot shown in any of the pictures. It did not overlap the second metatarsal or touch any bone at any point, but lay in the soft parts below and to the inner side of the base of the proximal phalanx of the great toe about half-way between the two positions shown in one of the skiagraphs, and well to the outside of the bone, remote from the position shown to be occupied by either of the other views.

“The error, so far as I can judge, arises from the difference of position of the camera with relation to the foot in the two pictures and the consequent difference of angle perspective.

“I could not help thinking if such skiagraphs were to be admitted as evidence in court how easily a lawyer could convince a jury that a surgeon who had had the picture to guide him in operating was an unfit person to treat such a case, for ‘just look at it, gentlemen of the jury, why there was the needle right before this so-called surgeon’s eyes,

where anyone who was not wholly incapable, or a native born fool, could have found it, and yet this man, etc.' Also, how good an example it furnished of the liability of error and of the value of such a demonstration in defence."—F. S. Watson.

"In reply to your communication of February 4th, I would say, first:

"(a) That I have found skiagraphy exceedingly helpful and fairly reliable in recent fractures attended with great swelling and injury to soft parts.

"(b) In fractures about joints the testimony of the X-ray is very valuable in showing the direction of displacements and of exact lines of fractures.

"(c) In epiphyseal separation the natural translucent condition of the epiphyseal juncture renders the process more unreliable but skiagraphy assists in determining displacement.

"(d) In fractures of the neck of the femur I have not found it positive, but if the operator uses judgment in the selection for the direction of the rays, the testimony is often of great advantage.

"(e) In ununited fractures skiagraphs taken from two or three points are of the greatest assistance in determining the question of necessity for operation.

"3. In one of my cases—a pistol-ball injury of the knee—the ball was located in the joint *at the internal condyle*, by two skiagraphs at different angles, but at operation it was found firmly embedded in the *posterior surface of the tendon of the patella*."—De Forest Willard.

In addition Dr. Keen has reported (*Philadelphia Medical Journal*, January 6, 1900) a case in which both the fluoroscope and skiagraphs very carefully taken showed a bullet apparently in contact with the surface of the tibia near its upper extremity. He cut down upon this point, but failed after an elaborate search to find the bullet anywhere on the tibial surface, but finally discovered it embedded in a deep cavity below the surface of the bone. He quotes from Dr. Ames, U. S. A. (who had made one of the skiagraphs), as follows:

"Recent bone formation does not make a shadow upon the screen, and I am unable to say how old the formation must be before obstructing the ray. Brief exposure will show a provisional callus upon a negative, when an overexposure will obliterate the impression of the new formation.

"Another point that I should have stated is that a 'mild' ray will show a new bone formation upon the screen which will not be shown by an intense ray—*i. e.*, a tube with a high vacuum. I have to my sorrow learned that the ray has many tricks, and we cannot always believe what we see, or rather fail to see, and a picture, to tell the truth, must have the plate, the object to be photographed, and the tube in proper relation during the exposure."

Dr. Keen adds: "This case is, I think, particularly valuable both as showing by means of Dr. Sweet's apparatus how accurately a foreign body can be located, and again how cautious we should be in interpreting what is apparently a perfectly plain case. We have yet to learn the errors into which we may be led by the X-rays, especially in cases in which medico-legal proceedings may be instituted and very unwise inferences drawn from what looks like a perfectly clear case."

In a communication to the *American Medico-surgical Bulletin*, July 10, 1897, Dr. George Everson, of Brooklyn, cites the following case, that is of unusually great interest from a medico-legal stand-point:

"Lillie B., aged fourteen years, diathesis syphilitic, was taken to a reliable X-ray studio by her father for a skiagraph of the left leg previous to operation on June 3d. The skiagraph shows at the middle and lower end of the shaft of the tibia exostoses. The lower end of the tibia is more translucent, and extending to the fibula from below upward and backward is a straight foreign body. At the operation, five days later, an incision from just above the ankle-joint to the tibial tubercle exposed two eburnations, one at the middle of the shaft and one at the lower third, numerous osteophytes which do not show in the skiagraph, and the tibial articular end in formation ostitis, but on diligent search no foreign body."

In a paper read at a meeting of the American Academy of Railway Surgeons, October 6, 1897 (*Journal of the American Medical Association*, April 30, 1898), Dr. R. H. Reed, of Columbus, called attention to the dangers of mistakes in skiagraphs.

He illustrated his belief in them by detailing three cases from his own practice. In one a skiagraph of a pin which was supposed to have been swallowed showed that it lay just above the sixth rib at a point where it was impossible for it to have passed down the trachea and become lodged in either of the bronchi. This skiagraph led to a gastrotomy and an elaborate exploration of the stomach and œsophagus. At a later period another skiagraph appeared to show that the pin was just below and a little to the left of the superior margin of the manubrium. This led to the decision to do a laryngotomy, but the child died, after being placed upon the operating-table, from the rupture of an abscess which entered the trachea. The pin was found with the point protruding obliquely into the trachea just at the bifurcation of the bronchi, the body of the pin being beneath the œsophagus and the head lying between the fourth and fifth ribs close to the spine.

Dr. Reed was convinced from the amount of force required to remove the pin from its position that it had been there from the start, and that the apparent change was an optical illusion.

(c) As to renal calculi, while the results have been increasingly good, it seems worth while to mention the following cases:

“An unreported case of which I have heard occurred in an Eastern city, in which a collar-button had slipped down a man's back and was skiagraphed, and his kidney cut down under the impression that this was a stone.”—W. W. Keen.

Dr. F. A. Packard, at a meeting of the College of Physicians of Philadelphia, mentioned one case in which the skiagraph showed what was thought positively to be a stone in the kidney, but was found to be later a mere defect in the plate. Dr. T. S. K. Morton, at the same meeting, took the ground that often when an X-ray picture is taken it is necessary that an expert should explain and interpret the X-ray picture as if it were a picture of what is seen in the microscope.

Dr. Keen has removed a calculus 12 mm. in diameter from a kidney which two skiagraphers had examined without obtaining any evidence of the presence of the calculus.—(Personal communication.)

“I do not know personally of cases in which the testimony of the X-rays has been found fallacious in the diagnosis of gallstones or kidney-stones, or has led to ineffective operations, though I do know of several cases where the attempt to utilize the X-rays for these purposes has been found quite disappointing and has been abandoned.”—(Roswell Park, personal communication.)

I may briefly mention some of my personal experiences here without specially classifying them :

I have seen a bullet beneath the scalp elaborately localized as being a certain distance within the scalp cavity. I have seen—and worried over until I learned better—several soundly healed fractures with apparent non-union and deformity. I have seen (skiagraphically) such a displacement of the fragments of the radius three days after wiring both bones of the forearm for ununited fracture that I reopened the wound with the idea of correcting the deformity, only to find the position perfect and the wires holding the fragments immovable. I have seen a skiagraph of a shoulder after injury, with enormous hæmatoma, showing a fracture of the clavicle and a humerus intact, although the clinical diagnosis had been fracture of the neck and head of the humerus without clavicular injury. This was absolutely confirmed by a later skiagraph. It is fair to say that except for some minor error of localization my experience with foreign bodies has been in the highest degree satisfactory, as it has in cases of suspected or existing renal calculi.

My total indebtedness to the X-ray in cases of fracture is great, but it has not been essential, nor has it in any instance altered my diagnosis, prognosis, or treatment.

So far as the spine, pelvis, hips, and skull are concerned it has been useless.

4. In regard to X-ray burns there can be little doubt that they offer possibilities of trouble for both skiagrapher and surgeon.

Dr. Frank Boyd writes as follows to the *Journal of the American Medical Association* (February 12, 1898):

“ In October, 1897, the undersigned was sued for malpractice in the sum of \$10,000 for subjecting a patient to the X-rays which produced a severe dermatitis, the plaintiff setting up the claim that the apparatus was carelessly used, and, further, that the means used was not yet sufficiently well understood as to warrant its use for the purpose of locating foreign bodies, etc. The suit was ably contested, and fortunately was decided in my favor, the court holding that in this as in other cases the physician was bound to use ordinary skill and judgment, and placed the case upon the same footing as chloroform anæsthesia.

“ Knowing that there were several suits of this character in the courts, I thought perhaps it would be of some interest to report it, since I have as yet been unable to find that the subject has been previously passed upon by the courts.”

An interesting medico-legal possibility is reported by Dr. Ross as follows (*American X-ray Journal*, January, 1899, p. 501):

“ Neither can we ignore the possible harm which might result in using it in cases of open wounds or injuries to the brain.

“ In a case in which I used this method (the resulting skiagraph was taken after the man's death, three weeks later) the use of the X-ray was used as a defence, on the ground that it seriously jeopardized the man's chances, and that with the use of other anæsthesia to keep him quiet was not only seriously condemned by the defence, but the danger was so portrayed that with the rulings of the court and other circumstances attending the case the prisoner was acquitted on the charge of a deliberate murder, and our use of the X-ray was a great factor in bringing about this verdict.

“ My greatest consolation in this case was that the same argument would have been used had I failed to use the X-ray to locate the bullet. Had the case died then the omission would have been claimed as neglect.

“ As it was, it was argued that it was a source of extreme danger to the patient, jeopardizing his chances and leaving a ‘ reasonable doubt ’ in the minds of the jury as to whether he might not have recovered had the X-ray not been used, in spite of positive demonstration that no harm resulted from the X-ray or ether—the man living three weeks after the exposure and dying of meningitis, which existed at the time the examination was made and was due to the presence of a bullet in the brain.”

In regard to this subject some careful experiments have been made by Professor Elihu Thomson, a summary of which is given in a paper in a recent number of the *American X-ray Journal*, November, 1898, No. 5. Professor Thomson first produced dermatitis on the little finger of his left hand by exposing it, unprotected and unshielded, to the rays.

He then made a second experiment on the next finger, using a piece of sheet-lead with a window in it to limit the effect. One-half of this window was covered with aluminum foil, the other half being left open; dermatitis was produced both on the part that was unprotected and also where it was screened by the aluminum foil. From this he concluded that electrostatic effect or electro discharges were plainly ruled out. He also produced a burn on another finger from a tube run off an influence machine, and expresses the opinion that burns are produced by those rays of the X-ray order which are most readily absorbed by the flesh—viz., from tubes of low vacuum.

In the same journal there is an article by Dr. C. L. Leonard, of Philadelphia, on the subject of X-ray dermatitis. He maintains that the devitalization and destruction of tissue are due to the static charges which can be kept off by a metal screen connected to earth, and speaks of two cases where the rays were employed to produce a therapeutic effect, and where the omission of the screen allowed the static charge to produce a deep necrosis as the result of the devitalization of the tissues. We have here two opposite opinions, both apparently verified by experiment.—*Archives of the Röntgen Ray*, February, 1899, p. 68, 69.

Oudin, Barelemy, and Darier, of Paris, made an elaborate report to the International Congress in Moscow, in August, 1897, on the subject of burns from the X-rays, basing their conclusions on forty-four cases. They assert that judging from the accidents at present recorded they seem to have been caused by too strong an electric current; the tube being placed too near the skin; the duration of the exposure; too quick a repetition of the sittings; individual differences of sensibility; the presence of some disease of the skin. But no one of these conditions always causes an injury with certainty, and, on the other hand, an injury may occur without one of the conditions being fulfilled. Nothing, therefore, has been absolutely determined as to the actual mode of causation, but the discussion of the theories has led to certain practical rules being established which will diminish the chance of their happening.

To attribute the liability to these accidents of a certain small number of those operated upon to an idiosyncrasy does not help much, but it is certain that the condition of the skin which prevails at the time, its relative dryness or moistness, and the presence of scars is of importance to the question. It is doubtful whether the duration and frequency of the exposure is really the most important factor, for experience shows that often quite a few sittings, even a single sitting, and one which has not lasted long, may effect the changes. It seemed to the authors that the distance of the tubes from the skin was of far greater importance, for they found that all tubes, of whatever make or power, when approached to within 5 cm. of the tissues, gave rise to unmistakable irritation of the skin. Other investigators have met with the same results (Apostoli,

Buguet) when using old tubes, or such as had weak currents (1 ampère, 5-6 cm. spark); while the authors when using the large tubes, fed with strong apparatus (9-10 ampères, 50 cm. spark), never met with any accidents, because they invariably kept the tube at a distance of at least 50 cm. from the persons who were being examined. They think that the degree of injury varies inversely with the cube of the distance, and not with the square, as is the case with light and heat.—*Medical Chronicle*, 1897 and 1898, p. 293.

Dr. Charles Lester Leonard (*New York Medical Journal*, July 2, 1898), in an article on the "X-ray Burn, Its Production and its Prevention," makes the following remarks:

"The X-ray 'burn' is not the result of the action of the X-ray, nor can it be produced by the X-ray, but the dermatitis produced is the result of the static currents or charges induced in the tissues of the high potential induction field surrounding the X-ray tube.

"The therapeutic properties attributed to the X-ray do not belong to it, but are due to the static charges and currents induced in the tissues which have long been known to be capable of producing similar results.

"The X-ray, *per se*, is incapable of injuring the tissues of the patient, and the dermatitis, which has been called an X-ray 'burn,' is the result of an interference with the nutrition of the part by the induced static charges.

"The patient may be absolutely protected from the harmful effects of this charge by the interposition between the tube and the patient of a grounded sheet of protecting material that is readily penetrable by the X-ray—a thin sheet of aluminum or gold-leaf spread upon card-board making an effectual shield."

5. As to the general attitude of the profession on the subject of the possible fallacies of the X-ray, I subjoin such evidence as I have been able to collect, beginning with the letters from members of the Association:

"To my mind it is a question of interpretation and judgment."—W. H. Carmalt.

"If I may presume to express an opinion on the medico-legal value of the X-ray, I should like to say that if the skiagraph is to be admitted as evidence absolute proof (if possible) should be furnished that the skiagraph was taken under proper conditions so as to avoid all distortion as much as possible, and I may also state, even at the risk of repeating what you must have observed, that oftentimes a skiagraph shows a great deformity, yet the patient has a perfectly useful leg or arm. I speak of this, as I was very much impressed in the early days of skiagraphy with the fact that a jury composed of laymen would be very apt to be favorably impressed toward patients (as plaintiffs) by such a plate. I have noticed this particularly about the ankle."—W. J. Dodd.

"It is my opinion, based upon personal experience, that the practi-

tioner cannot be held liable to damages in malpractice suits, simply on the X-ray evidence of imperfect union of fragments in cases of fractures. The criterion of deformity should not be the skiagraphic image, but the external appearance of the part as recognized by the naked eye; if the external appearance is good there is no visible deformity and no imperfection in the limb from the *functional* point of view, then I would consider the result *good*, and the surgeon should not be charged with malpractice. I have known of at least one instance (fracture of both bones of forearm) in which the external appearance of the arm was excellent and showed no deformity. The functional result was also excellent as regards pronation and supination, flexion on extension, etc., and yet in the X-ray image the union was markedly defective, showing an apparent displacement of fragments. In this case I believe the result obtained was as good as possible, and from a purely practical and esthetic point of view was perfect, as the patient admitted himself. I saw no reason for refracturing or resetting the bone, and had it been a court case I would have refused to accept the Röntgen ray images as the test of malpractice."—Rudolph Matas.

"In my hands the employment of the X-rays has not been of especial value in establishing positive diagnosis of fracture or dislocations. It has seemed to me that in making positive diagnosis our older methods have been satisfactory. In certifying negative diagnosis, however, I have found the X-rays of value in a number of instances. In given cases in which it seemed exceedingly probable that no fracture existed the picture furnished by the X-rays has given me added confidence. I have thus far found it of no value in diagnosis of fractures of the neck of the femur or of dislocations of the femur.

"I am at this time emphatically of the opinion that X-ray pictures should not be admitted in the courts as evidence in medical suits; first, because these pictures may differ materially according to the thickness of the overlying soft parts, the position of the plate and the tube, the length of exposure and the like; and, second, because we are not as yet able to interpret correctly in all instances the pictures themselves. This uncertainty should prevent their being introduced and admitted as evidence."—Charles A. Powers.

"There are sources of deception, the nature of which is not fully understood."—N. Senn.

"Examination under anæsthesia has given me as accurate a knowledge of most injuries as I could obtain by the X-ray. I trust that I may be able soon to express another opinion, but for the moment I have none other to give. I venture to think that to accurately read a skiagraph is of primary importance, and I doubt if I am yet able to do this. Then, again, there are skiagraphs and skiagraphs which vary delightfully."—L. M. Tiffany.

“ In fractures, too, I have learned also not to show the X-ray pictures to the patients, who, when he sees the outcome of treatment, believes it to be one that should be a better one.”—Robert F. Weir.

The subjoined opinions have been selected from those expressed by medical men from various parts of the country. They indicate a widespread and earnest interest in the subject and a very general fear of the misuse of the X-rays.

Dr. J. Williams, of Macon (*Journal of the American Medical Association*, May 7, 1898), says that while the discovery of Röntgen was a material advance in surgical diagnosis, it was not an infallible aid. Mistakes in interpretation could lead to mistakes in operating, and its value as medico-legal evidence was doubtful. Three times during the past year Dr. Williams had been misled by the X-ray photography, twice into performing useless operations for lesions supposed to be dependent upon apparent bone injury, and in one case a supposed tumor proved to be an anomalous rib. Fortunately the operation was necessary, and the results were as satisfactory as they could have been had a tumor existed. He thought that either of the two photographs of the bone injury exhibited in a court-room would have been damaging evidence in a malpractice suit had not the operation disclosed the fallacy of the skiagraph.

Dr. Samuel Lloyd, of New York (*Journal of the American Medical Association*, May 7, 1898, p. 1111), believes the use of the X-ray in legal work without careful preparation for that work on the part of the surgeon would do great harm. He says: “ To leave a skiagraph to a single individual who might be interested in the case and go into court would be a grave error, for the deformity might be accentuated very decidedly by placing the tube in an improper position, and consequently in every case that has to appear in court the X-ray picture should be taken before witnesses who can swear to the position of the photographic plate, the position of the patient on the plate, and the position of the tube, and at the same time who can swear to the distance at which the tube was placed from the patient, so that allowances may be made for any distortion that may appear in the picture, and as far as possible to avoid distortion.”

The *Journal of the American Medical Association*, May 28, 1898, says editorially :

“ Until we can better estimate nature's capacity for repair the skiagraph may cause much needless anxiety, and still more unfortunately for our peace of mind show us errors in position which the condition of the soft parts will not allow us to safely correct, or the process of repair may in the occasional case develop rather than prevent deformity. The X-ray may be made to exaggerate the existing deformity or displacement, from carelessness or purposely, and in suits for dam-

age no skiagraphs should be accepted unless made by a disinterested operator."

Dr. B. Lacey, of Council Bluffs, Iowa (*Ibid.*), thinks that we ought to give the matter of the skiagraph of a fracture more consideration than we have heretofore. He adds: "It seems to be an accepted fact that a skiagraph can be easily made to either distort or exaggerate any shadow of a foreign body or of the displaced fragments in a fracture. I have some misgivings as to the use of a skiagraph in cases of oblique fractures for this reason. There are a great many people who think that a surgeon in treating a mangled limb must make it as good if not better than it was originally, or else he has not done right. On this basis we are too often apt to be mulcted in cases of malpractice suits, when any competent surgeon who examines the case, after understanding the circumstances, knows that the best that was possible was done for the patient. Personally, I dread the oncoming of the skiagraph in these cases, unless the future shall develop greater accuracy."

Dr. J. Hodges, of Anderson, Ind. (*Ibid.*), believes that it is important to know that existing fractures do not always show, and that there are undoubted cases on record in which the radiograph seems to show a fracture when it does not exist.

Dr. F. W. Ross (already quoted from) recognizes very fully the possibilities of error, as is shown by the remarks which follow (*American X-ray Journal*, January, 1899, p. 501):

"A case in France was decided against a corporation on the evidence of a skiagraph which showed that the bones had not been united, although there had been no other evidence than the picture.

"This was incorrect, as we know that bony union in fractures takes, in some cases, months or years to unite—some never completely ossify. This must always be considered. Here the decision was in error, as there were no physical signs of fracture existing. Hence, we should never accept as an assured fact that we have an ununited fracture or deformity when other evidences are wanting or are even negative, especially if the patient's subjective symptoms are liable to be biased with the prospect of indemnity. In estimating the amount of damage done not only must we always compare the injured with the sound side, but remember that some deformities, like those of the wrist-joints, may be quite extensive and yet perfect coaptation of the bony parts have been made—with union of bone—although deformity exists. This is particularly true in Colles' fracture.

"Again, our failure to see the cause of deformity in the X-ray is not evidence that it does not exist if other symptoms point to its being present. (The contrary line of reasoning in the French case cited.) . . .

"Fractures and deformities may exist which, from the position, line

of fracture, effusion of blood, or character of deformity will not furnish evidence in a skiagraph or fluoroscope."

Dr. E. A. Tracy (*Journal of the American Medical Association*, November 6, 1897) remarks "that in all X-ray pictures there is distortion. The reason is that X-rays emanate from a point, and are not parallel. . . . Thus the nearer to their source is an obstruction to the rays the larger will be the resultant shadow or picture; the size of the shadow depends also upon the nearness of the object to the surface upon which the shadow falls; the further the surface from the object the larger the shadow. If we had for a source of X-rays a surface as large as the object to be pictured there would be no distortion, for the X-rays would be parallel. X-ray pictures in that case would be easy of comprehension, and never misleading. To read correctly the lesion of an X-ray picture the obliqueness of X-rays must be kept in mind and mental correction made for the disproportion and distortion caused by this obliqueness."

He illustrates by showing that with wires placed over the palm and wrist lines, merely turning over the hand between two successive skiagraphs appeared to have changed the relation of these lines to the bones, although, of course, it did not. He also calls attention to the differences in size and in outline, even in the same bones when taken from different angles." He concludes: "In my possession is a plate in which the deformity caused by Colles' fracture is quite closely simulated by a similar change in the position of Crooke's tube. The plate is of a normal wrist. The importance of this from a medico-legal point of view need not be enlarged upon."

Dr. Tracy writes again on the fallacies of X-ray pictures. He says that harm is threatened in the field of medical jurisprudence by the use of these pictures. They have been admitted as evidence in some courts, but he thinks their indiscriminate admission will result in injustice, because they can so easily lead to error. They should only be admitted as evidence of injury when they have been taken and presented under certain conditions."—*Journal Electro-therapeutics*, September, 1898.

Still later (*Philadelphia Medical Journal*, January 20, 1900) he writes:

"From practical work with X-rays I learned their fallacies more than two years ago, and hastened to bring the matter to the attention of the profession in the leading medical journal at that time. The importance of a knowledge of the fact to fellow surgeons who might be sued and indicted on the evidence of such pictures led me to publish the paper in which I do not assume, but demonstrate, the fallacies of X-ray pictures and explain some of their causes.

"The advantages of X-ray pictures in practice I fully appreciate and use daily in office work. Their great disadvantage—their fallacy—must never be lost sight of, especially in the courts."

J. Battersby, M.B., Major R. A. M. C., in an address on "The Present Position of the Röntgen Rays in Military Surgery," made the following remarks (*Archives of Röntgen Rays*, February, 1899, p. 76):

"For our own reputation and the welfare of our patients many important conclusions would be arrived at if we invariably made it a routine practice to examine with the Röntgen rays every case or suspected case of fracture that comes under our observation."

Oberst, of Halle, and Dr. Richardson, of Boston, found as the result of such a systematic course of examination that under ordinary treatment

"(1) Perfect union is rare.

"(2) Oblique fractures generally have some overriding.

"(3) In deep-seated bones there may be much bony deformity unrecognized.

"(4) If functional disturbance continues after treatment overriding is the rule."

H. P. Pratt (*American X-ray Journal*, April, 1899) says:

"While the X-ray is of advantage to the surgeon it has its disadvantages. Ever since its discovery, especially in the last year, every malicious person who can scrape up enough money to pay for a shadowgraph is having one taken for the purpose of bringing a damage suit for personal injuries or malpractice. It is coming to this: that a surgeon is not safe unless he has a shadowgraph taken before and after each operation. It is surprising to see the number of damage suits now pending against corporations, individuals, and especially surgeons for supposed injuries sustained or for malpractice, depending entirely on the shadowgraph as evidence. I will say the shadowgraph is not competent evidence because there is an opportunity for a great fraud to be perpetrated. Even the operator, if he is not careful, can be deceived himself. I have defended several corporations against shadowgraphs which showed a fracture where no fracture ever existed. An operator skilled in X-ray work can deceive the most skilled if they are not on their guard."

The Medical News (February 3, 1900, p. 192) quotes Lucas Championnière as to the dangers of being misled by a radiograph of a callus after fracture if the light was held in a wrong position when the radiograph was made. "Even when manual examination shows the bone to be united in a good position a radiograph may make it look much deformed. In consequence some surgeons have denied the accuracy of these shadow pictures. There is danger also that they may be used to influence the mind of a jury in a suit for malpractice. The volume, dimensions, and form of the shadow vary not only with the distance of the object from the plate, but from the light as well, so that two successive radiographs, unless the bone, the photographic plate, and the light are in exactly the same

position, will show two different deformities at the site of fracture. This variation in the size of objects is readily shown by taking a radiograph of a hand holding a needle, and then taking a second one with the light at a greater distance. The needle in the former case may easily appear twice as long in comparison to the bones of the hand as it does in the latter. These facts should be borne in mind in forming an opinion from a radiograph as to the amount of deformity which follows a fracture."

The *Lancet* (vol. xi. 1899) says editorially :

"Everybody knows that a photograph may be easily made to tell untruths and that a like unstable veracity may attach to skiagrams is clearly pointed out in an article in the *Minneapolis Times* quoted by the *Literary Digest* of New York. The matter has an important bearing on forensic medicine, and we therefore reproduce the paragraph :

" ' A Chicago electrical specialist has been making some interesting experiments at the suggestion of the attorneys of the Chicago Railway Company and others, and the results are somewhat startling. They tend to show that shadowgraphs may need a great deal of corroboration when introduced as evidence in a damage suit. One of the lawyers exposed his hand before the machine with the muscles relaxed, fingers extended, and the member generally in normal position. The shadowgraph showed the bones to be in perfect condition. The attorney then made a second exposure of the same hand, cramping the first joints of the fingers slightly. The ends of the fingers appeared to have been crushed, and the bones were apparently of unnatural size. In another experiment the operator showed that it was possible to arrange an object on the outside of the body and make it appear to be lodged within. Thus a bullet placed in the clothing on the back of the body was shown in the shadowgraph as resting against the spine. The expert stated further that he had learned by long experience that it is possible for the operator himself to be deceived as to the location of an object disclosed by the X-ray machine.' "

Dr. Willard, of Philadelphia, in a paper on the "The X-ray and its Use in Surgery," said :

"Although skiagraphy is a most valuable assistant to the surgeon, yet a word of caution is necessary. It has been most conclusively shown that the position of the tube, the direction of the rays, the method and time of the exposure, the magnification of portions of an object not in contact with the plate, the elongations of shadows from distant portions of an object, together with other varied conditions, may so completely distort the resultant image that error is certainly possible. A fracture may appear to exist when a bone has not been broken, and, on the other hand, it has been shown that a known fracture produced by osteotomy is not discoverable. These facts make it imperative that the medico-

legal value of these radiographs should be considered carefully, and pictorial evidence should receive only its due amount of consideration in connection with clinical evidence. Clinical evidence should have, and does have, large weight in the question as to results after fracture and other injury. Knowledge obtained by long experience and positive indications is far more valuable than any representation visible alone to the eye."

Williams and Lloyd (*Annals of Surgery*, October, 1898) write on the X-rays in medico-legal cases. They are not enthusiastic as to the value of such evidence. In taking these pictures it is very easy to increase in the picture any existing deformity by just placing the tube slightly out of proper position. Hence, if an X-ray print is presented in court it should have been taken before witnesses who can prove the position of the patient, the tube, and the photographic plate, and the distance it was from the tube.

Edmund Owen (*The Practitioner*, May, 1899) "shows that individuals who have been treated for fracture and who have gone around with ease and comfort may exhibit in an X-ray picture noteworthy deformity, and if an enterprising solicitor gets hold of such a case and exhibits such a deformity to a sympathetic jury, it is not improbable that damages might be meted out to the physician. Inconvenient illuminations of badly set fractures and in other cases in which nature has not been enabled to triumph over osseous lesions are becoming of frequent occurrence, as patients are getting in the habit of having pictures taken after some surgeon has made a diagnosis, and mistakes are thus nailed to the barn-door."

Mr. Golding Bird (*British Medical Journal*, April 21, 1900), in a clinical lecture recently delivered, said :

"I would here warn you all of a danger in skiagraphy. I know that it has happened for a patient to have his limb skiagraphed after he had been properly treated, and because the picture showed an exceedingly slight irregularity along the edge of the bone indicating the position of fracture, he went from one surgeon to another to obtain an expression of opinion that the union of the fracture was not perfect, in order that he might sue for damages the gentleman who had treated him. You will find that few fractures will bear the test of photography in that sense, and I should warn you against appealing to it in your own work as proof of the goodness of your treatment, lest you should be called to account for having produced a union of the bone absolutely as perfect in appearance as it was prior to the accident, although its utility now may be in no way impaired."

With this review of a small portion of the existing evidence the following conclusions are respectfully offered to the Association for discussion :

1. The routine employment of the X-ray in cases of fracture is not at present of sufficient definite advantage to justify the teaching that it should be used in every case. If the surgeon is in doubt as to his diagnosis, he should make use of this as of every other available means to add to his knowledge of the case, but even then he should not forget the grave possibilities of misinterpretation. There is evidence that in competent hands plates may be made that will fail to reveal the presence of existing fractures or will appear to show a fracture that does not exist.

2. In the regions of the base of the skull, the spine, the pelvis, and the hips, the X-ray results have not as yet been thoroughly satisfactory, although good skiagraphs have been made of lesions in the last three localities. On account of the rarity of such skiagraphs of these parts special caution should be observed, when they are affected, in basing upon X-ray testimony any important diagnosis or line of treatment.

3. As to questions of deformity, skiagraphs alone, without expert surgical interpretation, are generally useless and frequently misleading. The appearance of deformity may be produced in any normal bone, and existing deformity may be grossly exaggerated.

4. It is not possible to distinguish after recent fractures between cases in which perfectly satisfactory callus has formed and cases which will go on to non-union. Neither can fibrous union be distinguished from union by callus in which lime-salts have not yet been deposited. There is abundant evidence to show that the use of the X-ray in these cases should be regarded as merely the adjunct to other surgical methods, and that its testimony is especially fallible.

5. The evidence as to X-ray burns seems to show that in the majority of cases they are easily and certainly preventable. The essential cause is still a matter of dispute. It seems not unlikely when the strange susceptibilities due to idiosyncrasy are remembered that in a small number of cases it may make a given individual especially liable to this form of injury.

6. In the recognition of foreign bodies the skiagraph is of the very greatest value; in their localization it has occasionally failed. The mistakes recorded in the former case should easily have been avoided; in the latter they are becoming less and less frequent, and by the employment of accurate mathematical methods can probably in time be eliminated. In the meanwhile, however, the surgeon who bases an important operation on the localization of a foreign body buried in the tissues should remember the possibility of error that still exists.

7. It has not seemed worth while to attempt a review of the situation from the strictly legal stand-point. It would vary in different States and with different judges to interpret the law. The evidence shows, however, that in many places and under many differing circumstances the skiagraph will undoubtedly be a factor in medico-legal cases.

8. The technicalities of its production, the manipulation of the apparatus, etc., are already in the hands of specialists, and with that subject also it has not seemed worth while to deal. But it is earnestly recommended that the surgeon should so familiarize himself with the appearance of skiagraphs, with their distortions, with the relative values of their shadows and outlines, as to be himself the judge of their teachings, and not depend upon the interpretation of others who may lack the wide experience with surgical injury and disease necessary for the correct reading of these pictures.

[These conclusions were unanimously adopted as expressing the views of the American Surgical Association.]

REPORT OF A CASE OF ACUTE ASCENDING PARALYSIS, SHOWING HÆMATOPORPHYRINURIA.

BY CHARLES G. STOCKTON, M.D.,
OF NEW YORK.

THE patient, twenty-seven years old, was a domestic. Her father, when past middle age, died of some unknown cause; the mother and one brother of tuberculosis; three sisters are alive and well. Previous to the past two years the patient had lived for six years in the family of a physician, and it is known that she was well and strong. For two years past she had overworked and felt that she was losing her health. She had decreased twenty pounds in weight, but there was no specific disease. About a year ago she had obstipation of the bowels, and at one time went without an evacuation for fourteen days. In the early part of August last she became nervous and irritable, and was so anæmic that her employer requested Dr. Albert E. Woehnert to examine her. The girl appeared to be hysterical, and the other servants complained that she disturbed them. At night she tossed about in sleep and arose tired in the morning. Although she complained of a disagreeable taste, the appetite was good, tongue clean, and bowels regular. The pulse was 80 and the temperature 99.2°. Simple nervines were administered, and her temperature carefully recorded morning and evening for a week. The highest point reached was 99.4°. The urine was of a very dark color, acid, free from sugar, contained a trace of albumin, and was microscopically negative. Alkalies, alteratives, and nervines were given. The girl went into the country and returned on the 28th of August somewhat improved, having gained several pounds in weight, and declared that she was much better. On the 4th of September she was feeling well, but still complained of a disagreeable taste in the mouth.

On September 7th she came to the doctor's office and complained of pain in the back and abdomen. She was again nervous and was now unable to sleep. He prescribed sodium salicylate and sulphonal, three doses of five grains each, but these were vomited. Next day she was no better and had not slept. On September 29th the patient was still sleep-

less, nervous, and the pain in the back continued. Pulse ranged between 50 and 64. She had vomited a little and the bowels were constipated; the urine was of claret color, 1025 specific gravity, contained neither albumin nor sugar; indican, a small trace; it was highly acid, and negative microscopically.

The patient was sent to the Riverside Hospital, where she remained for one week, during which time she was restless, slept but little—not at all during the first three days—and complained of her stomach. Sulphonal (15 grains) the first night, and trional (15 grains) the second night, failed. These drugs thereafter were not given, and some rest was obtained from morphine and the bromides. Asafoetida and valerian were also administered, and, apparently, with benefit. On the 14th of September, against the protests of the hospital, she went home, where her temperature was still carefully taken. It showed but little variation, and the patient's condition could not be explained. Incipient tuberculosis was suspected. Physical examination of the chest showed, on inspection, equal and good expansion on both sides, anteriorly and posteriorly. The vocal fremitus was normal, slightly greater in the upper right chest. On percussion, the note was slightly higher pitched in the same region; posteriorly, there was no difference. On auscultation, the expiration was prolonged in the right supraclavicular and infraclavicular regions. There were no râles, although faint crackling was heard at the left apex. The first sound of the heart was weak, and the second pulmonary sound was over-accentuated; the physical signs were otherwise normal. The liver and spleen were of normal size; the lower border of the stomach was two inches below the xiphoid. The stomach contents, examined two and one-half hours after a breakfast of finely chopped beefsteak with stale roll and butter, showed three ounces of well-digested contents, with free HCl, 0.05 per cent., total acidity 80, and a good biuret reaction; some undigested starch, no lactic acid, good motion, and good absorption. At this time were passed 700 c.c. of urine in twenty-four hours, acid, claret color, 1020 specific gravity, a trace of albumin and indican, but no sugar, and it was negative microscopically. The further examination of the abdomen showed that it was not distended, nor tender on pressure. She had an excited and apprehensive appearance; her pupils were dilated; she was very nervous, and slept only when under the influence of morphine or the bromides. The urine continued of a claret color; the patient occasionally seemed to wander in her mind. She said she had no sensation in the buttocks when sitting down. This region was found to be anæsthetic. She soon defecated and urinated unconsciously and involuntarily.

The patient was so excited and restless at home that on the 18th of September she was sent to the Buffalo General Hospital, a diagnosis not having been made. When she entered the hospital she gave a history of stomach trouble dating from the middle of August. After eating she had experienced gastric distress accompanied by eructations of gas and a feeling of weakness and dizziness, and said that two weeks ago she was taken suddenly with a dull pain in the back, and now complained of a feeling of numbness and tingling in the feet. She said that this feeling had been experienced for several days, and at the same time she had lost strength and appetite. She now had weakness in her legs and involuntary and unconscious evacuations of the bladder and bowels; she did not feel the moisture; in the past twenty-four hours she had

occasional shooting pains in the legs. On entrance she felt as though she were losing her speech; was tired and sleepy, although unable to sleep. The temperature was 101.5° and the pulse 110. The following day she had little sensation or motion in the legs, and the deep and superficial reflexes were absent. On September 20th all sensation and motion had disappeared from the lower extremities; both motion and sensation of the trunk and upper extremities were much diminished. She was clear mentally, but frightened. The urine had the same claret color, although she had taken neither sulphonal nor trional for over a week.

On the 21st of September she was, at my request, examined by Dr. James W. Putnam, at which time there was found slight voluntary movement of the extensor muscles of the arm only. The deep and superficial reflexes were absent, and there was no response to the faradic current in the legs. There was slight electrical response in the extensor muscles of the arms and wrists—better on the right than on the left side. Sensation in the extremities and trunk had practically disappeared. On the 22d the area of diminished sensation extended upward to the level of the neck, but she had now regained the power to flex both feet slightly; she could not move the upper extremities at all. At times she was slightly delirious. On the 23d the motion of the feet was more noticeable; there was none in the hands. She had become somewhat dull mentally, but was rational when roused, and complained only of being tired, and frequently asked to have the position of the arms and legs changed. The temperature was 100° F., the pulse 135, and the respirations 35.

On the 21st of September, Dr. Lorenzo Burrows, Jr., made an ophthalmoscopic examination, which showed that on the nasal side of both optic disks there was swelling and congestion, the vessels being slightly tortuous, and the condition was believed to be the beginning of optic neuritis. On the 24th there was no change noticed in the condition of the eyes. On this date there was undoubtedly improved motion in the feet, and the patellar reflexes could be faintly excited.¹ There was complete loss of motion of the arms; she was unable to feel in the breast the large hypodermatic needle used in introducing subcutaneously the normal salt solution; she was practically without sensation except in the head. The mind wandered slightly, but she responded rationally to all questions. Toward evening she complained of oppression in the chest, making it difficult to breathe. At 11.30 P.M. she complained of thirst and drank eagerly. The pulse was 135 and the temperature 100° F. She said that she felt well, only that she was "so tired." Her consciousness was perfect until immediately before 12.15 P.M., when she died quietly.

The clinical diagnosis was that of acute ascending myelitis, involving all tracts of the cord. The treatment was limited to the use of normal salt solutions subcutaneously and diaphoresis by means of baths. Sleep was encouraged on two or three occasions by small doses of codein. An autopsy was positively refused.

A remarkable feature of the case was the persistence of the claret-colored urine. When first observed the color was dark amber or brown.

¹ There is a possible error in this observation.

After three doses, containing each five grains of sodium salicylate and sulphonal (which, by the way, were believed to have been vomited), the urine was noticed to be claret color, and it continued so to the end. A specimen was referred to Dr. Thomas B. Carpenter, clinical pathologist of the hospital, who made the following report on the coloring matter: Methæmoglobin, oxyhæmoglobin, alcapton, indol derivative, scatol derivative, phenol derivative, urobubrohæmatin, urofuscobæmatin were all examined for and found to be absent. Hæmatoporphyrin, however, was present, and accounted for the claret-colored urine. The vegetable pigments were absent; the urobilin derivatives were not present in sufficient amount to produce color.

Dr. Carpenter forwarded a specimen to Prof. J. Bergen Ogden, of the Harvard Medical School (whose article on hæmatoporphyrinuria appeared in the *Boston Medical and Surgical Journal* of February 24, 1898), who coincided with him that the pigment was hæmatoporphyrin.

The question suggests itself, Is there a direct relation between acute inflammatory processes of the cord and spinal nerves and the appearance of hæmatoporphyrinuria? Ogden, in the paper referred to, reports a case of post-diphtheritic neuritis which was under the care of Dr. Geo. B. Shattuck and Dr. C. F. Withington, of the Boston City Hospital, in which there was loss of sensation, reaching upward to the waist line, accompanied with involuntary micturition and dejection, and in which hæmatoporphyrinuria was present. In this case also it is possible that the condition was secondary to the taking of trional, which had been given in gramme doses. But there had elapsed a period of eleven days on one occasion between the taking of the drug and the appearance of the pigment in the urine. In my case it is believed that the coloring matter appeared before either trional or sulphonal had been taken, as the urine was observed to be very dark, although not distinctly claret color, more than four weeks before either drug was administered. Two days after taking fifteen grains of sulphonal in divided doses, which were believed to have been vomited, the claret color of the urine attracted attention. On the 9th of September one gramme of sulphonal was given, and on the 10th one gramme of trional. She died on the night of the 24th of September, and the symptoms of hæmatoporphyrinuria were continuous from the 10th to the 24th. It is thus seen that fourteen days elapsed without the administration of the drugs in question, and that only one gramme of each had been taken.

A CASE OF BROWN-SÉQUARD PARALYSIS.

BY RICHARD F. WOODS, A.M., M.D.,
OF PHILADELPHIA.

BROWN-SÉQUARD, the French physician, in 1863, reported a number of cases of paralysis, the result of unilateral section of the spinal cord. The summary of his investigations both from clinical cases and from experiments on the lower animals was, that if an alteration of the right side of the spinal cord exists, it produces a loss or a diminution of voluntary movement on the right side of the body and a loss or a diminution of sensibility on the left side, and *vice versa*; and, furthermore, the sensibility on the side of the motor paralysis is not only normal, but there is a pronounced hyperæsthesia for all, or at least for some, of the forms of irritation.

The following case presents most of the symptoms of unilateral lesions of the spinal cord described by Brown-Séquad, and, although the patient came under observation more than one year after the injury, the symptoms at that time were so well marked as to make the diagnosis certain. I am indebted to Dr. Henry Fisher for permission to report the case, and to Dr. F. J. Douglas for information about the patient while he was under his care in the Utica Hospital, New York.

The family history and previous history had no bearing on the patient's condition. He denied syphilis. The accident from which he suffered occurred on January 29, 1898. He was leaning over the railing of a porch when he was struck forcibly in the back of the neck with a knife.

He fell immediately to the ground, and when he attempted to get up he found that he could not raise his left leg or left arm. There was no loss of consciousness after the injury, although he says he felt considerably dazed. He was carried to the Utica Hospital, and his condition while in that hospital is described as follows by Dr. Douglas, who had him in charge: On admission there was complete paralysis of the left arm and leg. No loss of consciousness and no paralysis of the face. There was a punctured wound in the median line of the neck between the fifth and sixth cervical vertebræ. This wound was probed shortly after his admission and found to extend toward the left, and was about one inch in depth. There was slight bleeding from the wound.

He had incontinence of urine, but there were no rectal symptoms. His reflexes were tested on admission, and found normal. Temperature and pulse were also normal. The sensory condition was not noted.

The patient remained without improvement until the fourth week, when there was some movement noticed in the left hand. The next week movement returned slightly in the left leg.

From this time he continued to improve slowly, and in about seven weeks he was able to walk for a short distance. The wound in his neck had healed by first intention, and his general condition was good.

He remained in the hospital for two months, and when he was discharged he could use his left arm only slightly, and could also walk, but in a very uncertain manner. The man after he left the Utica Hospital was without treatment of any kind until he came to the Pennsylvania Hospital Medical Dispensary, in May, 1899, more than one year after his discharge from the Utica Hospital.

His condition when he presented himself at the dispensary was as follows: He was well nourished, muscular, and fairly intelligent. Pupils were normal. Pulse regular, good strength, and volume. Tongue protruded in median line. Lungs, heart, abdomen, spleen, and liver normal. On the back of the neck, to the left of the median line, about the level of the fifth cervical spine, was a small scar, the result of the punctured wound. His gait was unsteady and he dragged his left leg in walking.

When standing there was a fine tremor of the left leg, very slightly marked in the left arm.

The grip of the right hand (non-paralyzed) was much stronger than the left (paralyzed), and the left arm and leg showed atrophy, probably due to disuse.

The measurements of the arms and leg were as follows: Right arm: forearm, uncontracted, 26½ cm.; contracted, 28½ cm.; calf of leg, 36 cm.

Left arm: forearm, uncontracted, 24 cm.; contracted, 26½ cm.; calf of leg, 34 cm.

The patellar reflex was much exaggerated on the paralyzed side. The patellar reflex on the non-paralyzed side seemed normal. There was ankle clonus on the paralyzed side. The reflexes in the paralyzed arm were also exaggerated. The superficial reflexes were not altered.

The alteration in sensation in this case is very interesting, as it is so similar to Brown-Séquard's description of this symptom in his own cases.

1. In the left leg (paralyzed) the tactile sensibility was increased over the whole limb, while in the right (non-paralyzed) tactile sensibility was greatly decreased. The slightest touch of a camel's-hair brush was plainly felt in the paralyzed limb, while it was lost in the non-paralyzed. In using the æsthesiometer, the two points were easily distinguished on the paralyzed leg, while on the non-paralyzed, although two points were pressing, only one could be recognized by the patient.

2. There was hyperæsthesia to painful impressions in the paralyzed limb. Pricking and pinching gave him considerable pain. On the opposite side there was analgesia.

3. Muscular sense was lessened in the paralyzed limb, unaltered in the non-paralyzed.

4. Temperature sense was increased in the paralyzed leg, while it was lost in the non-paralyzed.

5. The patient could easily locate a sensitive impression in the paralyzed leg, but was unable to do so in the non-paralyzed limb. In regard to the upper limbs, the alteration of sensibility was the same as in the legs, with the exception of tactile sensibility, which was not affected on the non-paralyzed side, and was therefore not in proportion to the loss of sensibility to pain, which was certainly great in the non-paralyzed arm.

In regard to the vasomotor changes, although the surface temperature

was not taken by thermometer, the paralyzed leg was much warmer to the touch than the non-paralyzed. There was no change of temperature noticed in the arms.

The area of the alteration of sensation seemed limited above by a line drawn from a point about half an inch above the sternoclavicular junction in front, extending over the acromion process of the scapula to the second dorsal behind.

To sum up the symptoms in this case we had on the side of the lesion a paralysis of voluntary movement of muscular sense and probably vasomotor paralysis. There was hyperæsthesia of the trunk and limbs, increase of reflexes, and ankle clonus, while on the non-paralyzed side there was anæsthesia and no paralysis.

The following points appear of special interest :

1. There was loss of motor power in the arm and leg on the side of the lesion. This is due to the fact that the motor fibres for the arm and leg crossing at the decussation of the pyramids pass down the cord in the anterior and lateral columns of the side of the limbs concerned.

2. There was anæsthesia for all kinds of sensibility in the leg opposite the side of the lesion. This confirms the original theory of Brown-Séquard, that the sensory fibres decussate immediately after or within a short distance of their entrance into the cord, and pass up the opposite side.

Anæsthesia for all kinds of sensibility appears, however, in this case to be true only of the lower extremities, for in the arm, opposite the side of the lesion, although the sensibility to painful impressions was lost, tactile sensibility was retained.

This is true in a great many reported cases observed sometime after the onset of the symptoms. In Gower's case (*Clin. Soc. Trans.*, xi., p. 24) there was no loss of tactile sensibility and only incomplete analgesia. As an explanation of the cause of this phenomenon Schiff says that while the fibres conducting sensibility to pain decussate soon after they reach the cord and the sensations are conducted on the opposite side, the tactile sensations are conducted by the posterior columns of the same side and do not decussate.

Turner, from experiments on monkeys, comes to the following conclusion : That after a unilateral section of the spinal cord in the cervical region all forms of sensibility are not abolished in the non-paralyzed arms. Sensibility to painful impressions was absent or defective, but tactile sensibility was retained. This would indicate, continues Turner, that the fibres subserving tactile sensibility for the arms pass up both sides of the cervical cord, while those subserving painful and temperature sensibilities pass up the opposite side.

3. There was hyperæsthesia to touch and to all painful impressions on the side of the lesion. This Brown-Séquard thinks is due in a

great measure to a paralysis of the vasomotor conductors causing a greater influx of blood and a higher temperature; but, according to Michael Foster, it is due to a withdrawal by the injury of an inhibitory influence of some higher centre in the gray matter, by which the sensation is conducted—an influence which in the normal condition moderates the action of the gray matter.

4. The muscular sense was diminished on the paralyzed side, normal on the opposite side. This diminution of muscular sensibility, according to Brown-Séquard, is due to the fact that the fibres for the muscular sense run their course in the spinal cord uncrossed, just like the motor fibres.

Ferrier found in monkeys that after a hemisection of the spinal cord the sense of the positions of the limb appears absent not on the paralyzed side, but on the opposite side.

5. The deep reflexes were exaggerated on the paralyzed side. This is probably due to the cutting off of the reflex inhibitory influences coming from their centre, which is in the optic thalamus. The ankle clonus may also be assigned to loss of inhibitory influences. In nearly all the cases observed immediately after the injury the knee-jerk is absent or diminished on the paralyzed side, and normal or slightly increased on the opposite side, but during the progress of the case returns, and in the course of time becomes exaggerated. The experiments of Ferrier on monkeys show that immediately and for a short time subsequent to the operation the knee-jerk on the side of the lesion was in abeyance or very much diminished, while that on the opposite remained normal, but in a short time the absent knee-jerk returned and became much exaggerated.

In some cases of unilateral lesion above the hyperæsthetic area there was a small zone of anæsthesia. This symptom was absent in the above case.

Brown-Séquard thinks it is caused by the immediate involvement of the fibres conducting sensitive impressions which reach the cords through the posterior roots at a level or a little below the seat of injury. These fibres have to pass through the altered points to reach the other side of the cord.

The cause of Brown-Séquard paralysis has varied. Sections of one lateral half of the cord have been produced by stabs from sharp instruments. Compression, tumors of the cord, and inflammatory conditions may all cause a more or less sharply defined unilateral lesion.

In Gower's case the paralysis resulted from a gunshot wound in the mouth, the ball passing through the back of the throat and interrupting the conduction of the right half of the spinal cord.

In a case of Starr's (*Brain*, 1894) the paralysis resulted from caries of the fourth and fifth cervical vertebræ.

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Russel reports a case (*Medical Times and Gazette*, 1863) caused by disease of the cervical spine following rheumatism.

In MacKenzie's case (*Lancet*, 1883) the paralysis came on without any apparent cause, but the conclusion was finally reached that it was due to a syphilitic gumma.

In the *Lyons Medical Journal*, 1896, Pauly reports a case caused by a fall from a tree, fracturing the cervical vertebra.

In only one reported case convulsions have followed the injury. This occurred in one of Brown-Séquard's cases (*Lancet*, 1868, vol. ii., Case I.). I can add nothing as to the treatment and prognosis of this interesting group of symptoms following unilateral lesion. The patient was under observation for only ten days, when he left the dispensary and his whereabouts were impossible to determine.

EXCISION OF THE LACHRYMAL SAC AND GLAND, FOLLOWED BY AN UNUSUAL VARIETY OF NEUROPARALYTIC KERATITIS, MARKEDLY RESEMBLING CLINICALLY THE SO-CALLED LATTICE- LIKE KERATITIS.¹

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S. D., a married woman, aged fifty-eight years, was brought to me first in the early part of November, 1899, with an attack of acute dacryocystitis of the right side, the attack being the third within a few months. The abscess was opened and treated in the usual manner, healing taking place in about ten days with a patent duct and no fistula, Bowman's probe No. 7 being easily passed. The patient lived in a sparsely populated district, eight miles from the nearest physician, the latter being obliged to ride this distance in order to render his services. He was instructed in the use of the lachrymal syringe and advised to keep the duct patent and frequently cleansed.

The patient was of an exceedingly neurotic temperament, a condition that seemed to be hereditary, and that had affected all the female members of the family alike. There was a vague history of another member having had some inflammatory condition similarly situated that was finally pronounced to have been cancer.

Five weeks from the time the patient was first seen she presented herself, with another attack even more severe than the first, and as she refused to remain in the city for treatment longer than a few days after the acute symptoms had subsided, a silver canula was inserted into the duct. At her urgent request the physician was again instructed as to

¹ Read in abstract at the thirty-sixth annual meeting of the American Ophthalmological Society.

the method of removing the canula and cleansing the duct, and she was advised to come to see me again in two weeks. This she did, and the canula was found in place, the symptoms having subsided, and the fistula healed; but when she next reported, at the expiration of another two weeks, the lower end of the canula was found in the upper portion of the nasal cavity, having been forced through the lachrymal bone. Drainage was naturally imperfect, and there were symptoms of the formation of another abscess, the secretions being dammed up in the sac and nasal duct, it being impossible to effect an opening into the nose. Considering the distance of the patient from medical aid, the fact that she had suffered from several attacks, and that she absolutely refused to remain in the city for a sufficient length of time to allow me to treat the duct until it was well, it was advised that she have the lachrymal sac and gland extirpated.

This was done on the following day under ether anæsthesia without any complication, the method advocated by Holmes¹ being closely followed. The nose had been sprayed several times with a 1:2000 solution of potassium permanganate and the lower nasal meatus plugged to prevent hemorrhage from passing into the throat. A slightly curved incision was made over the lachrymal sac in the natural line of the face, and when the sac was exposed it was so bound down by adhesions that it could not be dissected out as a whole, but came away piece-meal. What remained was carefully removed with the curette, the next step being to obliterate the nasal duct. For this purpose Skeel's chalazion curette was found most admirable, it being small enough to pass into all portions of the canal. The wound was then closed with deep and superficial sutures. The incision for the removal of the gland was made just beneath the eyebrow on a line corresponding to and following the outer third of the orbital margin. The gland was reached without difficulty and with very little hemorrhage and the larger lobe removed by careful dissection. This wound was also closed by deep and superficial sutures. On the second day after the operation, when the dressings were first removed, some drooping of the upper lid was observed. On the fourth day half the sutures were removed, and on the fifth day the remaining half, the dressings being discarded.

On the eighth day following the operation, after the lid had regained about half of its lost movement, the lips of the wounds had firmly united and the sites of the incisions were indicated only by two narrow lines, but the patient complained of intense pain in the eye, which was accompanied by some conjunctival secretion. Inspection of the cornea did not at this time reveal anything abnormal, so far as could be seen; but on the following day, the ninth since the operation, there was a severe membranous conjunctivitis in both eyes, the membrane peeling off easily and leaving a smooth, not unusually red surface beneath. The cornea of the right eye was slightly abraded near the centre and considerably roughened, as if sprinkled with some coarse substance, staining readily with fluorescein, the edges of the abrasion being irregular, as if a bulla had broken and the edges curled. There was no anæsthesia of the cornea, conjunctiva, or surrounding parts. Hot and cold compresses and frequent irrigations were employed, but with little

¹ C. R. Holmes. Extirpation of the Lachrymal Sac and Gland. Archives of Ophthal., 1899, vol. xxviii., No. 1.

benefit, so far as the reduction of the membrane was concerned, the latter re-forming within an hour after being removed. Bacteriological examination of the latter showed only the diplococcus of Fränkel in small numbers. Frequent irrigations, hot fomentations, and the internal administration of stimulating treatment were kept up constantly. The site of the abraded portion of the cornea would shift from day to day, but at no time was the epithelium completely re-formed. At the time this was supposed to be due to the fact that bullæ had formed and broken, but at no time did we see a bulla before breaking, if any were ever present.

On the fifth day, after the beginning of the above series of symptoms, the roughened epithelium occupied about two-thirds of the corneal surface, and the latter was becoming quite hazy, especially in the lower inner quadrant. With the loupe the deeper portion of the cornea, probably Descemet's membrane, was seen thrown into folds, forming the so-called panel figure, described by Schirmer, by the crossing of the lines of the folds, this being much more marked in the most hazy portion of the cornea, and probably due to the unequal swelling of the latter. A little later the anterior portion of the corneal tissue became involved, and there appeared numerous minute lines, some straight and others branching, and while these were more marked near the centre of the lower inner quadrant—that is, the most hazy portion of the cornea—they were also present in all the quadrants. A narrow strip of the cornea, about $1\frac{1}{2}$ mm. wide in the periphery, seemed unaffected. These fine lines continued to increase in number and to cross each other in such a manner as to give the appearance of a lattice work, the openings between the lines not being perfectly regular, but imperfectly representing different geometrical figures, as irregular parallelograms, rhomboids, triangles, etc. This series of lines were much narrower than the deeper ones first described, and undoubtedly lie in the anterior portion of the cornea, so it is believed they were probably in Bowman's membrane. Additional evidence of their position was given by the appearance of a number of small but distinct spots of cloudiness here and there about the same level, and above these the epithelium became more rough and a larger surface involved; with direct illumination the lines and spots appeared black, but with indirect illumination and the use of the loupe they appeared grayish. It was thought at times that some of the lines and dots were translucent. The epithelium was so roughened that it was impossible to determine whether or not it was elevated at the site of each of the larger punctate spots.

The cornea was now partially anæsthetic, it being the thirteenth day since the operation. The membrane had entirely disappeared from the left eye, but was still forming in the right. Treatment was continued for several days along the lines mentioned, before the membrane entirely disappeared, the cornea becoming slowly more hazy all the time. The eye was now covered with a watch crystal for a couple of days, but the latter seemed to produce so much irritation of the skin by retaining the moisture, without, so far as could be seen, being of any benefit to the cornea, that it was removed and protective goggles substituted. The whole cornea and a part of the conjunctiva immediately surrounding it were now anæsthetic, and the former still roughened and partially abraded and quite hazy. The pupil dilated only moderately under atropine and the intraocular tension was always normal.

It was about this time that Dr. G. E. de Schweinitz, who had seen the patient with me some days before, suggested the possibility of thyroid extract being of some use. Its administration was therefore begun, and whether on account of the medicament or as a coincidence I do not know, but from the second day of its administration the eye began to improve. Within seventy-two hours after the first dose the corneal sensation had partially returned and the cornea had become much clearer. The patient, who was markedly neurotic, had also grown more cheerful and her general expression was better. She was now sent to her home in the country, under the care of her trained nurse, with the hope that the familiar surroundings, together with the fresh air, would help her neurotic condition and incidentally the eye. Unfortunately she was of such a temperament that she could not be persuaded to do anything she did not wish to do, and though we could not get her out-of-doors every day, the eye continued to improve, and in a few weeks there was noticeable only a slight nebulous-like haze in the lower inner quadrant of the cornea, no peeling of the corneal epithelium, and normal vision.

An examination made three weeks ago showed a slight haziness about $3\frac{1}{2}$ mm. in diameter near the centre of the lower inner quadrant out of the line of direct vision. The lattice-like appearance of the superficial lines could still be observed, the deeper lines having entirely disappeared, and over the nebulous portion there was still partial anæsthesia of the cornea.

In 1890, Biber¹ described a form of bullous keratitis following superficial abrasions of the corneal epithelium occurring some time after an injury that usually recurred for a long time with slight inflammatory symptoms, but finally ended in permanent recovery with but little if any corneal opacity.

In the same paper he describes a variety of keratitis which he has termed "lattice-like," in which there have been numerous fine lines in the superficial portions of the cornea, crossing each other so as to resemble lattice work, accompanied by many small opaque spots, at the site of each of which the epithelium was elevated, the latter being also more or less roughened, and later abraded and anæsthetic. It was usually found in several members of the same family, affecting both eyes, and terminated badly as regards the integrity of the cornea and vision. Cases of this character have also been recently reported by Haab² and Dimmer.³

There has also been described a condition in which numerous lines crossed each other in the deeper layers of the cornea, forming a sort of panel figure, and which were first supposed to be due to dilated lymph channels or infiltration of large nerve canals, but were afterward found

¹ Biber. Inaug. Dissert., Zurich, 1890.

² Haab. Die gitterige keratitis. Zeitschrift für Augenheilk., September, 1899.

³ Dimmer. Ueber oberflächliche gitterige Hornhauttrübung. Zeitschrift für Augenheilk., October, 1899.

to be due to a folding of Decemet's membrane (Hess, Schirmer) on account of a shrinking of the corneal tissue in cicatrization or to its unequal swelling in infiltration.

The case which I report seems to have possessed the symptoms of all three of these conditions. Whether they were produced in my case by some injury to the corneal epithelium or by injury to some portion of the trigeminus it is impossible to say, though a careful study of the manner in which the symptoms presented themselves and the later progress of the case would seem to indicate the latter. Whether there was direct injury to some portion of the fifth nerve, or whether the corneal condition was produced by an irritation, is another interesting question impossible to determine.

The literature of the pathology of trophic keratitis has been recently reviewed by Harlan,¹ from whom I quote the following :

“ The corneal lesions which follow section of the fifth nerve, or its paralysis from other cause, were formerly attributed to the loss of the trophic influence of this nerve, but since Snellen and Buttner reported that in their experiments on rabbits these lesions did not occur if the eye was protected, they have been quite generally attributed, at least in the text-books, to loss of sensation of the cornea and its consequent injury by external irritants. Numberless clinical cases have been recorded, and we have all met with such, which would prove this contention most satisfactorily if there were not others which, if less numerous, are equally positive on the other side of the question, and can be better explained by recourse to the older theory. They are too numerous also to be set aside as exceptions, and I have seen enough of them myself to make me quite sure, while still in doubt as to the true pathology of the disease, that the mechanical theory is insufficient.”

My own case seems to belong to that class in which the mechanical theory must be excluded, because the anæsthesia did not present itself until some time after the corneal disease had been established ; in addition, instead of securing improvement of the corneal disease by protection, for example, with the bandage, and later with the watch crystal, the condition gradually became worse. I am, therefore, inclined to the belief that the affection was produced by some disturbance of the trophic nerves of the cornea ; but the question as to whether there is a special set of trophic nerves, or whether it is a part of the function of the trigeminus to exert trophic influence over the cornea, and also as to whether the lesion was irritative or paralytic, must remain undetermined.

¹ Harlan, George C. Trophic Keratitis, etc. Trans. Amer. Ophthal. Soc., 1897, p. 107.

CLINICAL STUDY OF THE OCULAR SYMPTOMS FOUND IN
SO-CALLED POSTERIOR SPINAL SCLEROSIS.¹

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THE following broad generalizations of the ocular symptomatology found in so-called posterior spinal sclerosis (a disease according to the newest teachings dependent upon an atrophy or degeneration of the sensory neurones, followed by sclerosis, though most probably antedated by varying degrees of low-grade inflammation) are the results of a series of most carefully applied studies extending over a period of more than five years. Much of the clinical work has been obtained from the services of the two great hospitals with which I am connected. Every case studied, now amounting to more than one hundred properly made uncomplicated diagnoses, has been submitted to a routine examination embracing every detail of relevant value, while several have been carried to the post-mortem room and the microscope table for further examination as to the histological and pathological changes in the ocular structures.

Given in this way, as a brief *résumé* of the entire work, and a crystallization of the whole, as it were, the subject-matter may be fairly assumed as having some weight in scientific medicine and of being of working value to the clinician. As such it is offered.

Recognizing, even from the ocular stand-point, the broadness of the subject and its many ways of approach, the main and most salient points have been robbed of all detail, dyscrasic differences have been eschewed, and everything that has been considered worthy of notice has been given in a few brief words of description.

Realizing from an extensive clinical study the great primary divisions of the disease into a very badly termed preataxic and an ataxic stage—better an initiative (or probably inflammatory) and a degenerative stage—the separation of the subject-matter into two great clinical subdivisions (cerebral), “optic type”² and the spinal type, which latter many neurologists subdivide into the lumbodorsal and the cervical, is offered merely for sake of convenience and greater ease of comprehension, reserving for a later and more extended paper upon the different phases of the subject the minute divisions and special ramifications of the disease in its etiological and histological bearings to a number of

¹ Read before the American Ophthalmological Society at the Fifth Triennial Congress of American Physicians and Surgeons, May, 1900.

² By some classed among the cervical groupings.

more specialized articles which will appear from time to time as experimental work may accumulate and pathological material warrant.

The gross "optic type," appearing in about 10 to 15 per cent. of the total number of cases (the average age in my series having been forty-two years and the male sex predominating by 90 per cent.) is at first shown by fair if not normal vision. This is followed, without the appearance of any gross general symptoms or even pupillary changes in the majority of cases, by a whole series of visual paræsthesias and somewhat irregularly contracted fields of vision for white, with markedly diminished ones for color. In association they are frequently slightly marked, though undeniably present, spastic movements of the extra-ocular muscle series, combined with both normal and even exaggerated deep reflexes as particularly seen in the patellar tendon groupings. In this stage, in the majority of cases,¹ the tissues of the optic nerve-head will be found somewhat swollen; the edges of the disk will appear slightly hazed; the retinal arteries, especially in the syphilitic types of the disease, will exhibit perivascular change; the retinal veins will be more or less tortuous; and slight disturbances in the choroid will be manifest.

Sooner or later this grouping of irritative and inflammatory signs will be followed by symptoms of degeneration, each case being complicated with an intervening stage of apparent betterment of both the objective and the subjective conditions, lasting for varying periods of time, and dependent in most instances upon the grade of the disease, hygiene, and therapy.

The disease not kept in abeyance, atrophic processes in the optic nerves gradually and with only too great certainty take place. The optic nerve-head substance becomes intensely greenish-gray in tint, particularly in its temporal half. Its general capillarity lessens, the nerve-head borders again become visible, its surface sinks smoothly and quite evenly, exposing the cribriform plate in some instances, while the retinal and choroidal tissues about its edges appear somewhat thinned and degenerate.

If perivasculitis has been present the lymph-channel walls remain both thickened and opaque, while the vascular lumens are frequently encroached upon and diminished in calibre. If there has not been any perivascular change, the blood-streams, particularly the arterial, become narrowed and offer but slight contrast in tint to that of the contiguous structures.

Vision for both form and color, which may have induced false hopes

¹ Unfortunately, this stage will be the one that is most infrequently seen, unless every case of ophthalmic disorder presented to the clinician in which an ophthalmoscopic study can be made is submitted to routine methods of examination, as has been constantly done by the writer.

for permanent betterment by having arisen to varying degrees of acuity, saturation, and kind—and even in some instances to what is ordinarily supposed to be normal—gradually decrease until at last all light-perception is gone.

The visual fields having broadened in a few cases, and in quite a number of instances having shown a fair amount of color saturation, again contract, as a rule, most irregularly without the presence of any scotomatous areas until sector after sector of the retained portions are removed and naught but absolute blindness remains—a blindness which though terrible in itself seems in some instances to limit and even lessen many of the gross motor signs, and prevents the occurrence of the horrible visceral crises which make the lives of some of the cases frightful even to contemplate.

During this stage, the preataxic, as it is improperly called by many, and at times even rather early in it, some of the well-known pupillary, ciliary, and extraocular muscle signs become manifest in at least 30 to 50 per cent. of the cases. Both temporary and permanent failures of iridic reaction to light impulse (80 per cent.), with frequently uncontracted oval and ovoid pupils; commencing inability of continuance of forced lateral monocular and binocular fixation, with tremulousness of palpebral movement; doubtful slight pareses of convergence, and paretic diplopias of various kinds are among the prominent motor signs present.

Later, after the most variable of periods, though unfortunately only too frequently quite early in the course of the disease, without the appearance of many of the ordinary gross general expressions of the condition, the completed ocular picture of absolutely irremediable total blindness in the two eyes generally appears. The aimless gaze, the contracted pupil, the failure of the iris light-reflex, the increasingly uncertain movements of the iris to accommodative and convergent efforts, the extraocular pareses, with palpebral fissure narrowing, even the epiphora in a few instances, and the not rare spontaneous twitchings of the sympathetic fibres of the orbicularis muscles during both forced and ordinarily imperfect action, are offered the ophthalmic clinician as some of the main and most important ocular guides¹ for the diagnosis of the disorder.

The other type of the disease, “the spinal,” in which the classic symptoms of paræsthesia, in the trunk and upper and lower extremities, lancinating pains, enfeeblement of the muscular and temperature senses, rapid fatigue, inability to walk backward, loss of manual dexterity, etc., followed by lessening and loss of the main deep and superficial reflexes, inco-ordinations of the most bizarre types, and crises (often

¹ Hypotony, in some instances most doubtful, was found in but 15 per cent. of the cases studied.

barometric in type) of the most excruciatingly painful and serious character, seldom finds its way into the ophthalmic dispensary. In consequence, this form of the disorder is not so frequently seen by the ophthalmologist unless he have the wards of a large general hospital or the out-door practice of a special hospital for nervous diseases at his command.

For long periods of time, in spite of coarse objective appearances of the optic nerve-head, good and even normal vision in fairly large form, though markedly decreased, color-fields of irregular and slightly indented shapes in the great majority of instances are found. Miotic pupils, often pin-point in size, with intermittent losses of light-reaction, until at last the irides remain absolutely fixed to the strongest and the most prolonged light-stimulus,¹ are common. Early ataxias of all kinds, connected with the sixth, the third, the fourth, the fifth, and the seventh pairs of nerves, quite irregular in character (even to the slightest asthenopias, and uncertain pareses of accommodation), very variable in degree, and markedly interchangeable, seem at times even to usher in the main clinical aspects of the disease, while minor expressions of optic nerve-head and adjacent retinal change, such as very slight greenish-gray discoloration of the tissues of the optic disk, shallow and broad cuppings of the disk-substance back to the lamina cribrosa (which is very frequently visible), and a diminution of the retinal circulation without perivasculitis or retinal hemorrhage, represent the most pronounced findings with the ophthalmoscope. In fact, in spite of all these symptoms it seems that there is an absence of all gross inflammatory signs in the ocular structures, even in association with the coarsest general disturbances of the disease, such as dystrophies and the grossest trophic disorders.

These objective and subjective signs, both constantly and intermittently progressive and markedly interrelated, express their presence upon a sensory functioning power at first during exposure to feeble external stimuli, until at last nothing but small peripheral areas of light-perception in the lower temporal fields constitute the last visual expressions of physiological action, and exhibit their influences upon an unstable and variable motor apparatus that finally becomes fixed and at times all but useless.

¹ The so-called sympathetic skin-reflex of the iris—a most uncertain sign to obtain in this class of subject—was undoubtedly absent at times in some of the cases.

NOTES ON DIABETES.

BY JAMES B. HERRICK, M.D.,
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1. ON CASTS IN THE URINE DURING DIABETIC COMA.

A SMALL amount of albumin and a few casts are not uncommon in the urine of many, according to some of most, cases of diabetes mellitus. Cardiovascular changes or uræmic symptoms may give evidence of a true chronic diffuse or interstitial nephritis, and explain the persistence of albumin and casts. During or just preceding diabetic coma, however, casts may suddenly appear in such extraordinary numbers as to deserve mention. E. Külz¹ and Aldehoff² were the first to notice this phenomenon. Sandmeyer made a report on it in 1891 to the Tenth Congress of Internal Medicine. Mering,³ Rumpf,⁴ Nebelthau⁵ and Williamson confirmed it. It had been previously noticed that in some cases of diabetic coma casts were present, but it was apparently regarded as accidental. Since my attention was called to this phenomenon by reading Williamson's⁶ work I have seen it in all of three cases where I have sought for it. If the urine obtained as coma approaches be allowed to stand for a few hours, a light, hazy, grayish or slightly yellowish sediment will be seen at the bottom of the sediment glass, rising, perhaps, to one-sixth the height of the urine. The same sediment is, of course, obtainable by means of the centrifuge. This sediment will be found to consist almost entirely of short, broad, light-colored, finely granular casts. There is no relation between the amount of albumin and the number of these casts. In several cases Williamson watched the urine carefully for days before the onset of the coma, but no deposit was seen until just before the symptoms of coma commenced. The casts may appear twenty-four hours in advance of coma, and thus give warning of its approach. In cases of coma with recovery casts have been known to make their appearance with the manifestations of coma, and have disappeared as the symptoms have vanished. Aldehoff⁷ has seen them appear within three hours in the urine of a diabetic who returned from a fatiguing walk, with a rapid pulse, oppression in the chest, labored, deep breathing—in short, what seemed to Aldehoff as

¹ C. Külz. *Inang. Dis. Marburg*, 1895, reports ten cases of E. Külz's in which this phenomenon was observed.

² Aldehoff, in Külz's *Klinische Erfahrungen über Diabetes Mellitus*, Jena, 1899, p. 458.

³ *Ibid.*

⁴ Rumpf. *Ueber Diabetes Mellitus*. *Berl. klin. Woch.*, 1895, No. 31.

⁵ Nebelthau. *Berliner klinische Wochenschrift*, 1896, No. 34.

⁶ Williamson. *Diabetes Mellitus and its Treatment*. Edinburgh, 1898, pp. 178 and 286.

⁷ Aldehoff. *Loc. cit.*

threatening coma. The urine contained numerous "coma-casts." The urine, passed three hours before, had been free from such casts. The patient recovered and the casts disappeared.

The cases I have examined were as follows :

CASE I.—A man, aged sixty-five years, seen with Dr. Wynekoop. He had not consulted a physician for years until a few days before, when he had gone to Dr. Wynekoop, who found sugar, the first knowledge of the existence of diabetes. Questioning, however, revealed the fact that the subjective symptoms of diabetes dated back for more than a year. When I saw him coma was advancing. Urine was obtained by the catheter, and showed in addition to the ordinary findings of the urine of diabetic coma the sediment of finely granular casts above described. In this case, a large drop of urine being examined with a low power and no cover-glass being used, they were seen piled against and across one another like sticks in a loose wood-pile. There was but a trace of albumin. Death occurred in less than twenty-four hours after the specimen was obtained.

CASE II.—An old lady, aged eighty-four years, whose husband had died of diabetes seven years before, consulted me because of sleeplessness and mental depression. There were thirst, weakness, and furuncles. Sugar was abundant in the urine. Three weeks later a fatal coma developed. Enormous numbers of granular and hyaline casts were present as in the previous case ; albumin was but slight in amount.

CASE III.—In a case seen with Dr. Pigall, a woman, aged about sixty years, who had been told three years before that she had sugar in the urine, became dull, dyspnoëic, had several convulsions, followed by coma and death. There was no paralysis. The urine was loaded with sugar and albumin and contained very large numbers of casts. This may be an instance of uræmic coma or a mixture of the uræmic and diabetic.

This phenomenon may, as Aldehoff and Williamson claim, be of value in the early diagnosis of coma. With suspicious symptoms it might well be a confirmatory test, and it might enable the physician by early treatment to secure at least a temporary recovery. Naunyn, while admitting the presence of casts during coma, is rather skeptical regarding their occurrence in the enormous numbers Külz described, and especially as to their frequent appearance in the prodromal stage.¹ Even though later investigation may show that in other forms of coma there may be similar casts the value in the early recognition of diabetic coma is not lessened. Upon just what pathological condition it depends is unknown. It is possible or even probable that the kidneys during coma are overpowered by the attempt to eliminate some toxic substance, be it acetone, diacetic acid, or oxybutyric acid, and that there are rapid changes in the kidneys such as have been noted by many observers, especially the fatty degeneration and the alterations in the loop of Henle, and that because of these renal changes cylindruria results. As

¹ Naunyn. Diabetes Mellitus, p. 293. Nothnagel's System.

Rumpf expresses it, there is a destruction of the secreting epithelium that in the elimination of the toxic products of tissue-change suddenly gives way.

2. ON THE OCCASIONAL LOW SPECIFIC GRAVITY OF SACCHARINE DIABETIC URINE.

The specific gravity of the urine in diabetes generally rises with the amount of urine and the percentage of sugar. So true is this that, given the specific gravity and the amount of urine, approximate quantitative estimation of the sugar can be made by empirically constructed tables. Yet the specific gravity of the sugar-containing urine may be so influenced that it is lowered below the average of saccharine urine or even that of normal urine. A close study of cases of diabetes shows that at times diabetics may pass urine that contains sugar and that has a specific gravity as low as 1020 or much less. This does not include the polyuria with low specific gravity that sometimes precedes diabetic glycosuria or persists during convalescence and after sugar has disappeared. Polyuria may occur because of the development of a chronic interstitial nephritis, in which case the urine will show albumin and casts, but at the same time contain sugar and be of lower specific gravity. In fact, some go so far as to say that when in diabetes mellitus the specific gravity falls below 1020 one should always suspect the beginning of an interstitial nephritis. In these cases the sugar later may be reduced to a minimum or entirely disappear.

On April 26, 1900, I examined a man, aged fifty-four years, with a typical history of thirst, excessive appetite, emaciation, weakness, polyuria, and glycosuria. He was then on diabetic treatment by his physician. His total urine for twenty-four hours was 1500 c.c., specific gravity 1012. It contained a trace of sugar, albumin, and a few granular casts. There was beginning consolidation of the right apex. Here the nephritis apparently lowered the specific gravity.

Strümpell says that in those who are very weak the specific gravity may fall below 1020.

The drinking of large amounts of water or other fluid may lower the specific gravity in a marked manner. A patient of mine, aged fifty-eight years, with well-marked diabetes, drank large quantities daily of a mineral water of supposed curative properties. The specific gravity of the urine for days was never over 1019 and was often 1015 to 1018, yet the test for sugar was always strongly positive. Another patient, a fleshy man, aged fifty-five years, under observation for nearly a year, with typical manifestations of diabetes of the obese adult type, came into my office one day partially intoxicated and soon asked for a urinal. He passed about twenty-four ounces of urine, which I immediately tested for sugar. There was a prompt reaction. The specific gravity of the

specimen tested by different urinometers, and by another physician as well as myself, was 1004. The patient had been drinking beer with some friends all the morning, an explanation of the intoxication, the polyuria, and the low specific gravity.

On looking up the subject I find that even lower specific gravities than this are reported as occasionally met with. Of 224 cases in one of Külz's series, twenty-seven, or 12 per cent., showed at times a specific gravity of less than 1010. In one case it was as low as 1003. Eichhorst says that once in a while a specific gravity as low as 1008 or 1002 is seen. The latter case is perhaps the one Waterman reported in the *New York Medical Record* in 1882. Naunyn found a specific gravity of 1003 in spite of over 1 per cent. of sugar. And many other cases with occasional specific gravities below 1010 are reported. The lesson is, therefore, plain that the only safe way is to examine every urine for sugar, even when the specific gravity is low. One patient may be in the incipient stage of a complicating chronic nephritis, may be weak and debilitated, or may have been consuming large amounts of liquids, any one of which circumstances may tend to lower the specific gravity of the sugar-containing urine. And the importance of this fact to the life insurance examiner needs no elucidation. That some companies to-day only require the examiner to test for sugar when the specific gravity is above 1020 or perhaps 1015 shows that the occasional occurrence of saccharine urine of low specific gravity is not as generally recognized as it should be.

PNEUMONIC COMPLICATIONS IN PULMONARY PHTHISIS.¹

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EVER since the lungs of phthisical patients have been examined by pathologists the variety of lesions observed has made a great impression on all careful investigators. The variety is such that almost by itself the question arises whether all these different lesions could really be produced by one and the same disease, or whether several diseases working together were at the bottom of them.

This question found different answers by different observers, and a very heated scientific discussion arose over the question of the "unity" or "dualism" in the phthisical process. The most important exponent of the doctrine of the unity of tuberculosis was the great French clinician and anatomist, Laennec, whereas Virchow differentiated strictly between the tuberculum proper and the more diffuse caseous pneumonia.

¹ Paper read at the thirtieth annual meeting of the Medical Society of the State of California, at San Francisco, April 17, 1900.

The question seemed to find a solution when, in 1882, Koch discovered that in all tuberculous lesions it was possible to find the same one organism, the tubercle bacillus, but Koch himself doubted whether this one organism alone could produce the great variety of lesions which we find in the phthisical lungs, and suggested that in its destructive work in that organ it might be frequently assisted by other pathogenic bacteria; and a number of his pupils, among whom I should like to mention Spengler especially, have endeavored to ascertain how far in the production of the pulmonary lesions the tubercle bacilli themselves were concerned, and how far they were the result of a mixed infection with the tubercle bacilli and other pathogenic bacteria. In 1891, Orth made a special study of the pneumonic complications in pulmonary phthisis, and he came to the conclusion that the tubercle bacillus could produce in a general way, but especially in the lungs, two forms of lesions—one of them of nodular appearance, the tuberculum proper; the other a more diffuse pneumonic process with consecutive caseation, the so-called caseous pneumonia. The question how far in the production of these caseous pneumonias mixed infection was concerned he left in doubt, but he expressed his belief that the tubercle bacillus alone could produce at least certain forms of them, because in a number of cases he had searched for other bacteria and found none. The question was then taken up in 1893 by Ortner, who came to the opposite result, and claimed that the pneumonic complications of phthisis were due in all instances to mixed infection, although in a few of his cases he himself was not able to demonstrate any other bacteria besides the tubercle bacilli; but soon afterward, in 1894, Fränkel and Troje were able to prove that such an extreme view was not supported by the facts. They demonstrated conclusively that there are at least certain forms of caseous pneumonia in which at the post-mortem we do not find any other bacteria but the tubercle bacilli, and which, therefore, appear to be the result of a simple, not of a mixed infection. But these authors in their turn seem to have gone to an extreme in giving too little importance altogether to the mixed infections which undoubtedly occur quite often. In 1895, Professor Orth, in Göttingen, suggested to me to make further investigations in this direction, and since that time I have been interested in this important question. Part of the material used for the present paper was collected in Göttingen, and I desire to express my sincerest gratitude to Professor Orth for allowing me to make use of the same, and also for many valuable hints in regard to the method of investigation pursued; the other part of the material has been collected since I came to San Francisco.

In this necessarily short introduction I have mentioned only a few of the most important papers, and could therefore not do justice to a host of careful investigators who have treated the subject from one stand-

point or another ; but I hope to give a more detailed historical review in a more extensive paper on the same subject to be published later.

When we try to approach our subject systematically the first question to be answered would be, Where does the infectious material that causes the pneumonic complications come from ? There seems to be hardly any doubt that in most instances this infectious matter is furnished by the pulmonary cavities, at least all observers agree that in the vast majority of cases in which we find pneumonic complications we also find cavities containing such matter as would be apt to produce them when carried into healthy portions of the pulmonary tissue. Since the larger cavities are almost invariably in direct communication with the bronchial tubes, and thus with the air, they usually do not contain tubercle bacilli in pure culture, but other micro-organisms besides, sometimes saprophytes, but mostly pathogenic forms. Of the latter the following have been met with : *staphylococcus pyogenes aureus* and *albus*, *streptococcus pyogenes*, *pneumococcus*, *micrococcus tetragenus*, Friedländer's *pneumobacillus*, *influenza bacillus*, *colon bacilli*, *diphtheria* and *pseudodiphtheria bacilli*.

I myself have examined twenty-six cavities in thirteen cases. I found a pure culture of tubercle bacilli in seven of these twenty-six cavities ; the others contained a mixture of tubercle bacilli and other bacteria. The species encountered were the following : *streptococcus pyogenes* in one case ; *pseudo-diphtheria bacilli* in five cases ; *pneumococci* in six cases ; *pneumococci* and *pseudo-diphtheria bacilli* in four cases ; *staphylococci* and *streptococci* in two cases ; *pneumococci* and *staphylococci* in one case.

The infectious material is carried from the cavities to other parts of the lung by what is commonly called aspiration. The process in reality often is not so much of an aspiration as a gravitating downward of the infectious material in the bronchial tubes. Whether a pneumonic process is set up by such an aspiration depends largely on the number, the variety, and the virulence of the bacteria present in the material aspirated.

The point to which the infectious matter is carried also plays an important rôle. Pneumonic complications will naturally arise only when the material is carried at least as far as the infundibula.

In those cases in which the cavities are not surrounded by a continuous membrane of granulation and scar tissue the pathogenic organisms may enter adjoining healthy portions of the lung directly from the cavities, without travelling first through the bronchial tubes.

In all I have examined the lungs of fifty-six phthisical patients with regard to pneumonic complications, and among thirty-seven successive cases I have been able to find pneumonic complications in twenty-five instances. Of course, it is entirely impossible to examine every part

of a phthisical lung minutely, so I am ready to acknowledge that in some cases smaller pneumonic patches may have escaped my attention. The lesions that I have found have naturally not been of the same character in different parts of the same lung, and so the number of specimens actually examined has been much larger than the number of cases. The results of my examinations have been, shortly, the following :

In the first place I am able to confirm the statement made first by Orth, and later corroborated by Fränkel and Troje, namely, that there is one form of pneumonic process met with in tuberculous lungs which seems to be produced by a simple infection with tubercle bacilli. At least when we examine these pneumonic patches after the death of the individual we do not encounter any other bacteria in them. What makes it even more probable that they are the results of a simple infection with tubercle bacilli is the fact that these lesions exhibit histological characteristics by which they differ considerably from that form of bronchopneumonia which arises from a mixed infection. We can distinguish between different forms of this true tubercular pneumonia. The first one we might call the acute type. In it we find a central caseous area surrounded by air spaces filled with fibrin, epithelioid cells, and lymphocytes. The more peripheral air spaces usually contain desquamated epithelium, a few lymphocytes, œdema, or a little fibrin. The septa do not seem to participate actively in the process at all. The capillaries are often hyperæmic ; occasionally there are hemorrhages. Of such acute cases I have seen eleven examples, of which nine contained tubercle bacilli in pure culture ; in the other two, cultures made from the affected spots contained a few pus cocci ; but in spite of careful search for them they could not be found in sections, and were therefore most likely derived not from the diseased area itself, but accidentally gathered from cut small bronchial tubes. In the more chronic cases we find between the exudate and the caseous area a layer of tuberculous granulation tissue which pushes its way more or less far into the adjoining air spaces. The granulation tissue sometimes contains giant cells. The septa are either normal or show a moderate degree of infiltration with lymphocytes, and only rarely are they appreciatively thickened by the development of granulation tissue in them. Such more chronic tuberculous lesions were found eighteen times, and in all cases they did not contain any other bacteria but tubercle bacilli. The most chronic forms are those in which the tuberculous granulation tissue has a tendency to become transformed into a simple granulation tissue, in which, therefore, the tubercular process becomes a simple carnification—in other words, shows a tendency to heal. This I have seen twice.

Between these three forms of true tubercular pneumonia we naturally find all transitional stages, since essentially the process is one and the same, and differs only quantitatively, so that in a given specimen

it may be difficult to classify the lesion among one of these three groups.

The acuteness of the process seems to depend to a certain extent on the number of tubercle bacilli present in the diseased spot, so that in the cases with many tubercle bacilli the lesions had an acute character. But this correspondence between the acuteness of the lesion and the number of tubercle bacilli is not complete. The virulence of the bacilli and the condition of the patient therefore also seem to exercise an important influence upon the amount and character of the reaction in the tissues.

Here I should like to mention shortly an objection that has been raised by Baumgarten against Orth, namely, whether the processes just described were really rightly called tuberculous *pneumonia*. Baumgarten, and with him Troje, claims that inasmuch as in them we observe the appearance of epithelioid cells in the air spaces and in the more chronic forms, even of a more or less typical tuberculous granulation tissue, they do not differ materially in their structure from ordinary tubercles, as we find them in miliary tuberculosis of the lungs or other organs, the only point of difference being that in these cases the tubercular tissue develops inside of the air spaces. But Baumgarten and his followers seem to overlook entirely that with the presence of the epithelioid cells, etc., we have in the tubercular pneumonias an inflammatory exudation which is best shown by the constant presence of a very large amount of fibrin in the lesions—a fact which was first duly emphasized by Orth. It is true that fibrin has been found in miliary tubercles also (Falk), but only in a very small quantity. Now, it seems that it is a general principle in pathology that “*a potiori fit deuominatio*.” These lesions, therefore, are rightly classified among the pneumonic processes, whether the exudate contains epithelioid cells or not; otherwise one might just as well object to calling a chronic abscess an abscess because the pus in it contains a certain number of fibroblasts.

Such an area of tuberculous pneumonia may become the seat of a secondary infection with other pathogenic bacteria by way of the bronchial tubes; and then the bacteria, mostly pus cocci, seem to find a soil very suitable for their development in the caseated matter, and in developing in it they seem to add very considerably toward its rapid disintegration. This corresponds well with the results of some animal experiments made by Prudden, who was able to produce cavities in the lungs of tuberculous animals by injecting pure cultures of pus cocci into their bronchial tubes, causing in that way a secondary infection of the tuberculous areas in them.

But although secondary infections favor the rapid disintegration of the caseous material, and with that the formation of cavities, they are

by no means necessary to this end. I have frequently seen evidence of a breaking down of caseous material without secondary infection. In these latter cases I have never missed finding a very large number of tubercle bacilli in the disintegrating material.

The extent of the lesion, whether it affects only small portions of a lobe or whether it involves an entire lobe, or even an entire lung, depends, of course, entirely on the amount of material aspirated and the way it is accidentally distributed in the pulmonary tissue.

There remains one question of great clinical interest, namely, What is the ultimate outcome of these tuberculous pneumonias? In most cases the local outcome seems very unfavorable in that they lead to rapid caseation and disintegration of the pulmonary tissue. The rapidity of the process varies, of course, with the more acute or more chronic character of the process, but the few specimens in which we find little caseation and a transition of tuberculous into simple granulation tissue seem to prove that sometimes even these forms of tuberculosis may exhibit marked tendency toward healing.

In other forms of pneumonic complications we have mixed infections from the beginning. In these cases other pathogenic bacteria are carried simultaneously with the tubercle bacilli into the healthy parts of the lungs. Here also we can distinguish between more acute and more chronic forms. The acute forms present to the naked eye entirely the aspect of ordinary bronchopneumonias, and do not differ materially from them in their microscopical structure. In these first stages of the process caseation may not be present. In some cases they betray their at least partly tubercular nature by the presence of epithelioid cells in the exudate. In the more chronic cases of mixed infections we find either a very marked tendency to rapid caseation or disintegration, or, on the contrary, the process may also end in carnification.

Among sixteen cases of mixed infection there were nine cases of acute bronchopneumonia without caseation; four cases with apparently very rapid and extensive caseation, and four cases with carnification. The bacteria, found together with the tubercle bacilli, were the following: Pneumococci, ten cases; streptococci, one case; pneumococci and streptococci, one case; pseudodiphtheria bacilli, one case; pseudodiphtheria bacilli and streptococci, one case; cocci of unknown nature, in one case.

In one case, which histologically had all the characteristics of an acute mixed infection, I was unable to find any bacteria besides a few tubercle bacilli. The only explanation that I can offer in this case is the supposition that other bacteria had been present, but were already overcome and destroyed at the time of the post-mortem.

It is interesting to note that the only two cases in which there was an infection with pseudodiphtheria bacilli there also was carnification.

Besides these two outcomes caseation on the one hand and carnifica-

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tion on the other, there seems to be one other of which it is not possible to obtain anatomical proof. It is very likely, and seems to be supported by clinical evidence also, that not rarely the acute pneumonic process set up by a mixed infection heals. Clinically the recovery may be and often is complete, but the presence of tubercle bacilli in these lesions makes it very probable that anatomically the process will not heal completely, but with a remaining more or less extensive simple tubercular lesion.

Ordinary lobular and lobar pneumonias naturally may occur in the course of phthisis, but they do not seem to be frequent. At least among my cases I have been able to find only two cases of bronchopneumonia and one case of lobar pneumonia in which no tubercle bacilli could be discovered in the exudate. It has often been asserted that such simple pneumonic complications could be secondarily infected with tubercle bacilli, but as far as I see it has not been possible to furnish an anatomical proof for such an assertion.

There is also the possibility that acute mixed infections may in course of time assume the character of a simple tubercular pneumonia after all other bacteria except the tubercle bacilli have been destroyed in them. In view of the case in which the lesions showed the histological characteristics of a mixed infection, and nevertheless did not contain any other bacteria but tubercle bacilli, I think that such may be the case; and when we consider that cavities rarely contain a pure culture of tubercle bacilli, whereas simple tubercular pneumonias are met with quite often, we might argue that such an occurrence is perhaps more frequent than we are inclined to believe, when we judge merely from the anatomical and bacteriological findings at the post-mortem.

When we try to get a correct idea of the general importance of the pneumonic complications in phthisis, all forms included, it becomes of importance to note how frequently they are met with, and, from an anatomical stand-point especially, how frequently they are the immediate cause of death. As I have mentioned above, I have found pneumonic complications among thirty-seven successive cases twenty-five times, showing that, at least in the later stages of the disease, they occur most frequently, and I am sure that in most of these cases the pneumonic complications were the direct cause of death. Frequently they seem to be accompanied with acute generalized infections with the bacteria that are associated with the tubercle bacilli in causing them. At least among seven cases of acute mixed infections in which I have records of a bacteriological examination of other organs, there are five with more or less complete generalization of the infection. In one of them there existed a general infection with the pneumococci, in another a general infection with Friedländer's bacilli. In two of the cases pneumococci were found in the lungs and liver, and in one pseudodiphtheria bacilli also in lungs and liver.

These generalized infections, which undoubtedly belong to the terminal infections that are so commonly observed in chronic wasting diseases, may arise, though, in cases of phthisis in which there are no pneumonic complications. Among twenty-seven cases of uncomplicated tuberculosis of the lungs I had terminal general streptococcus infection three times, general staphylococcus infection once, and in seven more cases pus cocci, apparently absorbed from the lungs were found in one or the other organ, mostly in liver or spleen. These cases illustrate that there may be a direct absorption of the pus cocci from the pulmonary cavities into the blood-current without mixed infections of the nature of pneumonic complications.

Last of all the question arises, Is it possible to diagnose the presence of a mixed infection in the lungs clinically by bacterial examination of the sputum.

Kitasato, under Koch's direction, has worked out a method by which he claims it is possible to obtain the material contained in the pulmonary cavities free from the admixtures it receives in passing through the bronchi, trachea, larynx, pharynx, and mouth while it is expectorated. The process consists in a repeated washing of the sputum in sterilized water. Even if the process was perfectly safe, which is disclaimed by some authors, the only thing that we could achieve by the method would be to find out whether pulmonary cavities contain other bacteria in addition to the tubercle bacilli. That, of course, does not necessarily imply that there is really a mixed infection, because these pathogenic bacteria can live in the cavities without necessarily penetrating into the surrounding tissues, which latter only would constitute an infection.

That this is not merely a theoretical construction, but an actual fact, is borne out by my personal observation. In seven cases I could find pathogenic bacteria other than the tubercle bacilli in the cavities, and no acute mixed infections in any part of the lungs. It is possible that I have overlooked small areas of mixed infection in a few cases, but hardly in all of them, because I have paid especially close attention to them. But although, therefore, the presence of pneumococci, streptococci, or other bacteria in the washed sputum does not prove conclusively the presence of a mixed infection, I do not deny absolutely the clinical importance of the method, but it ought to be used only with the understanding that a positive finding makes a mixed infection more or less probable but not certain.

That the results at which I have arrived from the study of my cases is not only a personal one and produced by conditions such as they exist in certain localities only where I happened to make my examinations, is proved by the fact that, in his excellent work, which is based on a minute study of twenty-one cases, Professor Sata, who has recently studied the same question under Ziegler's direction at Freiburg, arrives

at essentially the same conclusions. There are only a few points in which my observations are at variance with those of Professor Sata. In the first place, he does not seem to have found pure cultures of tubercle bacilli so frequently in open cavities as I have. When he finds in his specimens almost exclusively what he calls "mischpneumonie," that is, lesions partly due to tubercle bacilli, partly to infection with other bacteria, whereas, according to my statements, it is not so unusual to find pneumonic lesions in which we find tubercle bacilli only. This apparent discrepancy may be due largely to his not having separated so strictly as I have the results of mixed infection and those of apparently simple infection with tubercle bacilli which often occur in immediate proximity to one another in one and the same specimen. However that may be, we both agree in regard to the main point—i. e., the importance of mixed and secondary infections in the development of the destructive process in phthisical lungs.

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A CASE OF DERMOID CYST OF THE MEDIASTINUM,
 WITH REMARKS UPON THE ETIOLOGY AND EMBRYOLOGY, AND A SURVEY
 OF RECENT CASES.

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A BRIEF pathological account of the following case was published in the *Mount Sinai Hospital Reports*, 1898, vol. i., but a minute description has purposely been delayed in the expectation that another instance of this rare disease might present itself. In this report no cognizance has been taken of differential diagnosis, nor has a detailed account been given of the cases hitherto tabulated by previous writers on the subject. The history of the case follows:

Fanny G., aged thirty years, a native of Russia, was admitted to the hospital on January 24, 1898. Her family history was entirely negative.

She had been married seven years, and was the mother of three children, the youngest of which was five weeks old. She gave no history of any previous acute illness, or of rheumatism, syphilis or tuberculosis. She had never suffered any injury. Ten months before admission she noticed a small swelling on the right side of the chest anteriorly, above the breast, and at the level of the third rib. The swelling was not tender to the touch nor red in color, but it occasionally caused slight pain. The tumor did not increase in size until four months ago, when it began to grow suddenly, and one month ago attained its present size. She had not noticed any glandular swelling or any disturbance in lactation, and had continued to nurse her infant. Aside from the presence of the tumor, she considered herself in perfect health, being free from all febrile disturbance or other symptoms.

Status Præsens. The patient is tolerably well nourished, and a physical examination of the internal organs fails to reveal the presence of any organic disease. Opposite the third rib on the right side of the chest anteriorly is a tumor the size of an orange, the skin over it being freely movable. The mass is evidently adherent to the underlying tissues, and the tissues at its base appear to be somewhat indurated. The tumor is neither tender nor sensitive, and it gives a distinct sense of fluctuation. Aspiration by means of a small trocar reveals the presence of thick, yellowish fluid of a honey-like consistency. There are no physical signs referable to compression of bloodvessels, nerves, or any of the mediastinal contents. Cough and expectoration are absent, and no pulsation of the tumor is noticeable.

Operation. Three days after admission Dr. Gerster decided to explore the tumor, and the patient being anæsthetized by Schleich's mixture No. 3, an incision four inches long was made over the long axis of the mass. The pectoralis major and minor muscles were divided parallel to their fibres, and the cyst was exposed. It was so firmly attached to the pectoralis minor muscle that upon dividing the fibres of the latter, the cyst was ruptured and a thick, brownish fluid containing small particles of gritty matter was evacuated. The wall of the tumor was more widely opened, and there was exposed to view a multilocular cyst, one small pocket after the other containing a similar fluid. The last pocket incised was found to lead from the thoracic cavity by an extension of the cyst through an opening between the third and fourth costal cartilages. More fluid welled up through this opening, which was found, on probing, to lead deeply into the thorax. Through the enlarged opening, by means of a scoop, a considerable amount of thick fluid, gritty, calcareous matter and strands of hair were removed from the intrathoracic portion of the cyst. In order to expose the latter, two inches of the third rib near its costal end were resected. The patient was turned upon her side and the contents of the cyst thoroughly washed out. This exposed to view a large cavity occupying nearly the entire anterior mediastinum, the cyst wall being attached to the pericardium, diaphragm, and right pleura. The extra-thoracic portion of the cyst wall was dissected away, several large drainage-tubes were introduced into the cavity, and the wound was packed with gauze.

During the division of the intercostal muscles the right pleural cavity was accidentally opened, on account of the dense adhesions, and to avoid any possible subsequent involvement this opening was carefully sutured and two inches of the ninth rib in the posterior axillary line

were resected, and a drainage-tube was inserted. After the operation the patient's temperature was 102.4° F., pulse 120, and the respirations 50. Her general condition was fair.

For the next four days a profuse discharge from the wound necessitated a frequent change of dressings and irrigation of the cavity. On the fifth day signs of consolidation appeared over the base of the right lung, and the temperature rose to 103.4° F., pulse 100 to 128, respirations 28 to 36.

February 2d. The cyst cavity still contains much fluid and detritus. Pulsation of the heart can distinctly be seen along the median line as well as the rising and falling of the diaphragm with each respiration. Dulness, bronchial voice and breathing, and extensive râles are still present over the right lower lobe. The provisional drainage-tube that had been inserted in the ninth intercostal space has been removed, and the pleural opening is healing. The patient's general condition is decidedly worse.

10th. Although signs of resolution have been present for four days, and the temperature is now 100.6° to 102° F., the patient's condition has not improved. The urine to-day contains a trace of albumin.

13th. On account of the difficulty in keeping the cavity properly drained, a siphon arrangement for continuous irrigation is applied. The morning temperature is now 99.6° F., and the evening temperature is 102.2° F., and the patient is suffering from pronounced toxæmia, with marked cerebral excitement and involuntary evacuations.

25th. The cyst cavity is growing smaller in size, and the discharge is of a more solid consistency.

March 9th. The patient is rapidly emaciating, and an extensive bed-sore has developed. The mental condition is unchanged.

17th. The patient has failed slowly, and died at 9 o'clock A.M.

Post-mortem Examination. The body was examined fourteen hours after death. Marked emaciation and a moderate amount of rigor mortis are present. In the second intercostal space on the right side of the sternum is an oblique incision 5 cm. long, leading to a cavity about 8 cm. x 6 cm. in size, bounded by the pleura covering the inner surface of the right lung, and by the pericardium. The wall of this cavity varies from 4 mm. to 1 cm. in thickness, is of a firm, fibrous nature, and is more or less covered by fatty, granular detritus, in which are seen numerous bits of light-colored hair. Here and there are several firm polypoid excrescences springing from the cyst wall, and varying in size from a bean to a large walnut. These are also covered with fine, short hairs. The sac wall is firmly attached to the lung, from which it cannot be separated. A section made through the wall at this site shows that it is firmly united to the parenchyma of the lung, and several minute fibrous septa seem to extend slightly into the pulmonary tissue which appears somewhat compressed at this point. The outer surface of the cyst wall is also attached to the large vessels in the mediastinum by fibrous bands. Several smaller cysts presenting the same general characteristics are seen springing from the large cyst. In one of these is a large polypus measuring 3 cm. x 2 cm.

The lungs are slightly œdematous, and a few pleural adhesions are present on both sides. The heart presents a slight dilatation of the right auricle and a moderate concentric hypertrophy of the left ventricle. The liver is congested and somewhat fatty. The spleen is moderately enlarged, amyloid in character, and presents a slight increase

in the amount of its connective tissue stroma. A few small hemorrhagic areas are also seen. All of the other organs examined appear normal. No trace of thymus gland can be found.

Microscopical Examination. Specimens from various parts of the cyst wall were hardened, cut, and stained, and the following appearances noted.

The cyst wall is firmly united to the pericardium, pleura, and diaphragm by dense fibrous connective tissue. This is especially marked at its connection with the pleura, where no definite demarcation is observed, and small offshoots of fibrous tissue can be seen entering the pulmonary tissue proper. At this situation the substance of the lung shows evidence of compression. Beneath this dense fibrous layer is a fine loose meshwork of connective tissue rich in bloodvessels. Many of the smaller arteries show a marked obliterating endarteritis, and here and there are small areas of round-celled infiltration principally about the bloodvessels. A layer rich in cells and vessels is next seen, and it is in this portion of the wall that the skin elements are found. These elements consist of numerous hairs, many of which appear as regularly formed as in normal skin; others again show marked cystic dilatation at their roots. In addition to this, several small bundles of smooth muscle fibre, seemingly, from their size and position with reference to the hairs, erector pili muscles, were observed. Sebaceous glands are present in the greatest abundance, and in most situations are perfectly normal in their general appearance and formation. Only a very few sudoriferous glands are encountered. It is upon the surface of the polypoid excrescences described above that the skin formation is most plainly noted. Here, also, are large portions of adipose tissue. In a few places are small areas of mucous glands with a connective tissue matrix between the alveoli, and their lumen filled with mucin. In one situation a group of spherical vesicles, each vesicle being lined with a single layer of columnar epithelial cells, with oval nuclei, is seen. These vesicles are filled with homogeneous contents that take the usual staining reaction for colloid, and so closely resemble thyroid glandular tissue that any distinction is impossible. Here and there, on the free margin of the cyst wall, are small patches of stratified epithelium, and upon all of the nipple-like polypi the epithelial cells take the distinct appearance of the rete Malpighii, and are covered with the usual corneal layer of the epidermis. In some places the surface of the cyst wall is necrotic, the cells do not take the stain well, and a granular appearance is noted. No attempt at a formation of bone tissue is observed in any of the sections, nor is any ciliated epithelium present, but in some of the sections, mainly in those cut through the polypoid excrescences, several areas of cartilage cells are seen.

REMARKS. Dermoid cysts of the mediastinum are of such rare occurrence that a glance at the literature of the subject may not be amiss. Hare¹ has collected 520 cases of mediastinal tumors in his monograph, and of this number but eleven were dermoid cysts. In 1800 autopsies made at the Brompton Hospital, mentioned by Fowler and Godlee,² thirty cases of mediastinal tumor were found without a single instance of dermoid cyst. Hoffmann³ has searched the literature on the subject since the year 1825, and has been able to collect but fourteen cases. He suggests dividing these tumors into three classes :

1. True dermoids.
2. Dermoids containing cartilage and cylindrical cells.
3. Dermoids combined with lymphoid tumor.

That a division into these three groups is not a satisfactory classification will presently be shown in discussing the embryology of the subject. In the case just described the cyst was for a time considered to belong to Hoffmann's first group. After making sections from various parts of the cyst walls the presence of cartilage was finally demonstrated. Several authors have reported cases of dermoid cyst in the thoracic cavity, but have failed to mention them as originating in the mediastinum. It is the writer's opinion that in most instances the mediastinum will be found to be the original source of the cyst.

Pflanz⁴ has made a more careful search of the literature and has collected a series of twenty-four cases, to which he has added a personal case. The patient was a man, aged twenty-one years, who presented a cyst in the anterior mediastinum below the right clavicle and bulging forward behind the first and second ribs on the right side. The cyst was opened by an operation and drained. It contained hair, fat, and dermoid detritus, and the patient left the hospital with a narrow fistula remaining. The reader is referred to the original article for a careful description of the twenty-four recorded cases.

Ekehorn⁵ has reviewed the cases tabulated by Pflanz, and has added to the list five additional cases from the literature and two personal cases. His first case was that of a woman, aged twenty-one years, with a cyst in the lower portion of the right chest attached to the mediastinum. Bone and cartilage were seen, and between some of the small areas of cartilage ganglion cells and nerve fibres were present; ciliated epithelium was also found. The largest single piece of bone was 1½ cm. x 2 cm. in size, from which several teeth protruded. Its whole appearance was similar to a portion of the upper jaw. The second case was a patient of Dr. Fogman's, in Stockholm, who presented a cyst to the left of the heart and attached to the left lung. Two teeth protruded from a polypoid growth in the cyst cavity. The author did not have access to the account of Smythe's case, which he mentions only by title, so I shall insert it here.

Smythe⁶ describes the case of an unknown woman, aged thirty years, who died suddenly. The autopsy revealed the presence of a cyst occupying the entire upper lobe of the left lung, and pressing upon the pericardium and mediastinum. The cyst contained dermoid tissue and hair, and in its cavity was found a bony mass weighing eight grammes. The report does not state whether the cyst was a true mediastinal one, but it undoubtedly belongs to this class.

Another case not mentioned by either Pflanz or Ekehorn is that published in 1893 by Kretz.⁷ The patient was a man, aged thirty years, in whom the diagnosis of pulmonary tuberculosis and bronchiectasis in

the left upper lobe was made, and who subsequently expectorated bits of hair. At the autopsy tuberculosis of both upper lobes was found. Besides this in the left upper lobe was a cyst the size of an apple, containing hair, fat, and pus, and to its wall a polyp was attached by a pedicle. The cyst wall contained skin, hair, and sebaceous glands, and a perforation into a bronchus was demonstrated. This specimen was examined by Kundrat, who agreed that its origin was the anterior mediastinum.

Since the publication of Ekehorn's paper there has been another case reported by Bergmann.⁸ This was a man, aged thirty-eight years, who presented a painful swelling at the junction of the second and third costal cartilages with the sternum on the right side. A fistulous opening was seen, and when this was enlarged by an incision a cyst containing dermoid material, fine hairs, teeth, and polypoid growths was found.

These polypoid or warty excrescences are present in nearly all of the cases, and vary much in general appearance and size. They project into the cyst cavity and are usually supplied with short hairs, most frequently light in color. Occasionally these hairs may be of considerable length. According to Sutton,⁹ these polypi may even be genuine mammary glands, and may secrete colostrum. In the author's case the epidermis over these growths was thrown into manifold rugæ, giving a distinct papillary appearance to the sections.

There still remain two cases that have not been included in the previously mentioned lists. Ogle¹⁰ described an interesting case in which the polypoid growths presented an unusual appearance. The patient was a man, aged twenty-eight years, who died as the result of a profuse hæmoptysis. The sputum was offensive, and there were physical signs of an empyema. A diagnosis of bronchiectasis was made. At the autopsy a cyst was found in the lower lobe of the right lung partly in the mediastinum. Its origin was undoubtedly in the mediastinum, whence it invaded the lung, pressing upon a bronchus. The fluid contents looked like blood mixed with pus. Projecting from the wall of the cyst were five or six cream-colored, pear-shaped bodies, "with the rough aspect of skin, resembling the swollen tongue of a corpse," and covered with hair. A large tooth was also found embedded in the wall. The microscopical examination showed stratified epithelium covering fibrous and fatty tissues, and many sebaceous glands and hairs. Inflammatory tissue was present upon the surface.

The other case is the one reported by W. Hale White,¹¹ of a cyst the size of a large orange attached to the anterior and right surface of the pericardium, and adherent to the right lung. This cyst contained dirty, yellowish fluid, with cholesterin, oil globules, solid sebaceous matter, and some loosely attached hairs.

These cases, together with that of the author's, bring the total number of mediastinal dermoids up to thirty-seven.

The presence of bone, cartilage, mucous glands, smooth muscle fibres, connective tissue, and fat, together with thymus and thyroid elements arising from the mesodermal and entodermal layers, should place many of these cysts in the group of teratomata if a finer distinction is to be attempted. In but two cases have I been able to find thymus gland tissue present. Marchand¹² describes a cyst with two processes extending upward along the trachea to the thyroid gland, containing thymus tissue and Hassal's corpuscles, and Pinders¹³ also describes lymphoid cells and thymus tissue in the first of his two cases.

Thyroid tissue has been described only by Waldeyer,¹⁴ who reports a cyst occupying the lower half of the right chest with a pedicle extending upward to the thyroid gland. This pedicle contained bloodvessels and thyroid tissue. In my case, as described above, there were small vesicles lined with columnar epithelium, which must be considered thyroid gland. Of Hoffmann's third group, dermoids combined with lymphoid tumor, there is but one recorded instance. Pinders describes a cyst occupying the anterior mediastinum from the first to the fifth rib, which contained dermoid elements, and was combined with lymphosarcoma. Metastases were found in the left lung.

The thick, honey-like contents discovered by aspiration in our case has been described by Löwenmeyer,¹⁵ who reports the case of a man dying with severe signs of dyspnoea. The left chest was filled with a tumor mass, tightly adherent to the pericardium and diaphragm. Virchow studied this tumor, and found it to be a mixed type of growth, containing spindle and giant cells in parts, elsewhere distinctly striated muscle fibres (*myoma striocellulare*), and multilocular cysts containing thick, honey-like fluid. The lining of the cysts was partly epidermis and partly ciliated epithelium. Some structures resembled embryonal lung tissue, other parts showed tissue of a carcinomatous nature. This case must then be classed with the teratomata or with this variety associated with malignant tumor.

Belonging to this class is also the case of cystosarcoma of the lung arising from a mediastinal dermoid reported by Jores.¹⁶

ETIOLOGY AND EMBRYOLOGY. For a better comprehension of the etiology of dermoid cysts of the anterior mediastinum it is necessary to glance at the embryology of the branchial clefts, and of the thymus and thyroid glands, from which these cysts are believed to originate. According to Born¹⁷ and Hertwig¹⁸ the thymus gland is derived from the entodermal lining of the third gill-cleft. In his earlier writings His¹⁹ described its origin from the ectoderm of the cervical sinus; but three years later he published an article in which he withdrew his former opinion and agreed with the observations first made by Born. Some writers suggest that the thyroid gland may be an etiological factor in the production of these cysts. Remak, in 1855, first described the origin of the thyroid from the entoderm of the pharynx, but it required

the combined work of Wölfler,²⁰ Born and others to show that the median and lateral portions were derived from the floor of the pharynx between the first and second branchial arches, and from the entoderm of the fourth gill-cleft respectively. According to Minot,²¹ as soon as the gill-clefts become open passages the line of demarcation between ectodermal and entodermal lining cannot be distinguished on account of the intimate fusion of their respective cells.

It is known that the third branchial arch may dip downward over the fourth branchial arch, and becoming united to the side of the pharynx, enclose a part of the precervical sinus, forming a small closed pocket lined with ectoderm. The buried furrow of the third cleft lies in close proximity with the thymus gland, and if from some exciting cause or irritation a growth or proliferation originates in this epithelial remnant it is easily seen that by its extension downward into the thorax a cyst may be formed. This will explain many of the simple dermoid cysts, not, however, those containing elements from all of the three embryonal layers. According to Wilms,²² teratomata may arise from a single sexual cell by a displacement or separation of tissue (monogerminal implantation); or they may be due to the inclusion of a rudimentary twin (bigerminial implantation). Wilms has concluded to classify many of the dermoid cysts of the ovary and testicle representing all three of the germinal layers with the rudimentary parasites originating from a single sexual cell, and not as a result of the inclusion of a rudimentary twin.

Ekehorn, stating that whereas double monsters are not uncommonly seen, due to abdominal inclusions, and that union of twins by the chest (thoracopagus) also occurs, believes that, in order to explain the multiplicity of tissues found in some dermoid cysts, we must consider them to be formed by the process of bigerminal implantation, one of the twins remaining as a rudimentary undeveloped embryo. This is certainly a most convenient theory upon which to base our observations concerning those cysts that contain tissues from all of the embryonal layers. That these dermoids should consequently be classified with the teratomata is beyond question, and therefore I would suggest the following division:

1. True dermoids containing only ectodermal structures.
2. Teratomata, or dermoids with the addition of structures from the entoderm and mesoderm.
3. True dermoids or teratomata, with the addition of tumor formation.

This classification, I believe, fulfils all demands made by the histological findings in the cases in the literature more satisfactorily than Hoffmann's division of these rare growths, and is the result of my study of every reported case. It will serve, too, as a basis for grouping future cases, since it is founded on the histological evidence of all published dermoid cysts of the mediastinum.

For the privilege of publishing this case, and for the courtesy in fur-

nishing the clinical data, I am indebted to Dr. A. G. Gerster, attending surgeon to the hospital.

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A CRITICAL SUMMARY OF THE LITERATURE

ON THE

SERUM DIAGNOSIS OF TUBERCULOSIS.

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DEMONSTRATION of the presence of tubercle bacilli constitutes practically certain proof of the existence of tuberculosis, but unfortunately tubercle bacilli are often absent from secretions in just the period in which diagnosis is most important, and the disease is frequently so situated that the bacilli do not gain access to secretions that may be examined. Reaction to tuberculin, while almost absolute as an indication of the existence of tuberculosis, is unfortunately a very uncomfortable method for the patient, and one which the majority of the profession still fear to use. While there is no real evidence that such fears are justified, patients are likely to rebel against the discomfort of a reaction to tuberculin, and it is scarcely probable that this method will ever be very freely used outside of hospitals, as tact in the retention of cases will often interfere even when the procedure would be otherwise advantageous. Under these circumstances a method that entails no special distress to the patient, and yet may be considered to give reasonably constant and reliable results, is extremely desirable, and such a method was

suggested by the successful use of the Widal reaction in the diagnosis of typhoid fever. Serious stumbling-blocks in the use of this method in tuberculosis lie in the fact that the tubercle bacilli in ordinary cultures are not homogeneously distributed throughout the culture medium, and are not motile. Hence, cessation of motility and clumping of the bacilli cannot be demonstrated, and upon these phenomena depends the recognition of the occurrence of a reaction. It has been shown, however, that in some cultures tubercle bacilli exhibit active movement—whether this is merely corpuscular or is a voluntary movement is unknown—and it is likewise recognized that frequent agitation of liquid cultures of tubercle bacilli will result in a fairly homogeneous distribution of the bacilli throughout the culture medium.

Arloing and Courmont have prepared cultures which they state can be used with success in the serum diagnosis of tuberculosis, and the results claimed by them are so encouraging that the method seems to deserve further investigation than has been accorded it, particularly since the work of other investigators has given striking confirmation of the conclusions reached by Arloing and Courmont. The number of men who have interested themselves in the matter is small, however, the reason for this being evident when one learns of the difficulties attendant upon the preparation of proper cultures and to a lesser extent associated with the performance of the test. A much more extended use of the method is therefore necessary before its value can be determined. The difficulties are, nevertheless, not insuperable, and the subject is so important that its worth should be definitely settled.

The several publications of Arloing and Courmont cover in part the same ground and may be considered together. They emphasize the difficulty in obtaining homogeneous cultures even under favorable circumstances. All cultures cannot be made homogeneous. The method to be followed is the use of the classical glycerin peptone bouillon as a medium, inoculating this with a bacillus which has been grown in the laboratory for a long time and has become decidedly attenuated. The one they have used produced only glandular lesions in guinea-pigs, and did not cause death. A most important point in order to secure homogeneity of the culture is daily agitation. Reinoculations should be made about once a month, using always identically the same culture medium and the same amount of mother culture; the latter should always be of the same age. The new generations become more and more unlike the original ones. The medium becomes cloudy, and microscopical examination shows that the bacilli are almost entirely isolated, though to a slight extent collected in small masses. They show marked morphological changes and variations in staining; they will often grow on ordinary gelatin or bouillon without glycerin; they produce a uniform creamy-white veil on glycerin-agar, and in the liquid medium develop motility which ultimately becomes very marked. Were the successive

generations not known one could scarcely recognize them as tubercle bacilli. If they are not agitated, however, but left to grow undisturbed they gradually reacquire their ordinary morphological and tinctural characteristics, and form cultures of the usual appearance. Months of patient effort are required to develop a properly homogeneous and motile culture.

When the test is to be carried out one should use a rich culture eight to twelve days old; if the culture is more than two weeks old the reaction is usually unsatisfactory. The technique is more difficult than in carrying out the reaction with typhoid serum. One should take only the upper portion of the culture, as the lower part usually contains small masses of bacilli. The blood from the patient should be drawn into small tubes, and the serum may then be obtained by allowing the clot to retract spontaneously or by centrifugation. The tubes and the finger from which the blood is drawn should be well sterilized before the puncture. Reaction does not occur with normal serum in a dilution of as much as 1 to 5, and in tubercular subjects it rarely occurs in dilutions greater than 1 to 20. Hence, we should mix in small tubes proportions of serum and culture of 1 to 5, 1 to 10, and 1 to 20. After this the tubes should be kept inclined at an angle of about 45° , and examined after two, ten, and twenty-four hours. Subsequent changes have no significance. If reaction occurs one observes with the naked eye more or less complete clarification of the mixture, and a deposit of small flakes along the lower edge of the tube, and microscopically one sees that the bacilli have formed clumps and are no longer motile. The macroscopical examination is facilitated by holding the tube over a black surface; in the microscopical examination it is important to handle the tubes gently, as the clumps are easily broken up.

Dubard seems to be the only one besides Arloing and Courmont who has prepared cultures of his own. The value of the reaction has been investigated by Mongour and Buard and by Bendix, but they obtained their cultures from Arloing and Courmont. Dubard used Ferran's method, and obtained cultures with characteristics closely corresponding to those described by Arloing and Courmont.

The clinical results reported by the originators of the method concern examinations of 186 persons. Of these 128 gave a positive reaction, while 58 were negative; 96 of the positive cases were known to be tuberculous, or proved to be so; 10 of the negative cases were also definitely known to have tuberculosis—a fact which would appear at once to speak strongly against the value of the test were it not that they were all advanced cases, and that in the use of tuberculin it is well known that frequently no reaction occurs in advanced cases, because there is already excessive intoxication with tuberculin; and the animal experiments of Arloing and Courmont, which will be quoted, showed that very virulent or severe infections give no serum reaction. The two methods of diag-

nosis are therefore alike as to this point, but it does not reduce the value of either as a diagnostic measure, as diagnosis in such cases is practically always easy. If these cases are excluded from the statistics, Arloing and Courmont had 100 per cent. of positive reactions in cases known to be tuberculous. In affections considered to be other than tuberculosis they had 26 positive reactions in 60 cases; 9 of these, who were subsequently examined at autopsy, showed the presence of tuberculosis; it had not been suspected by the clinician in any of the cases. Twenty apparently healthy persons were examined, and six gave the reaction. There was no opportunity for determining whether these six subsequently showed tuberculosis or not. The authors compare these results with those of Beck, whose statistics concerning the diagnostic use of tuberculin are the largest extant, and decide justly, so far as their figures go, that their method gives about the same results as tuberculin, and that each method proves the value of the other.

Mongour and Buard first recorded four cases of pleurisy, nine of pulmonary tuberculosis, and seventeen cases with various affections. Of the cases of pleurisy, three which were certainly tuberculous were positive, the other, which proved to be not tuberculous, was negative. The cases of phthisis were all positive; in one the clinical diagnosis was in doubt, but autopsy showed a tuberculous cavity. The seventeen other cases gave very interesting results. They included instances of rheumatism, epilepsy, hæmoptysis, and various other affections. In all but two the result of the reaction corresponded with the subsequent clinical course or with the conditions found at autopsy, and in some of them the positive reaction led to careful physical examination and the discovery of tuberculosis, which had previously been entirely unsuspected. For example, in a case of chronic rheumatism that had been under observation for six years with no symptoms suggesting tuberculosis, examination after a positive reaction led to the discovery of râles in the apices and of tubercle bacilli in the sputum. The two cases which showed discrepancies between the reaction and the post-mortem findings were not of much importance, as the post-mortems were incomplete. The same authors later record twenty-five further observations with results which were similarly favorable to the test, but which cannot readily be summarized. They state that the microscopical observation of the cessation of motility is more satisfactory than the macroscopical test. They consider the test accurate and easy of practice when proper cultures are once at hand.

Correspondingly favorable results are reported by Bendix—normal persons not giving the reaction in dilutions as low as 1 to 3, and persons with diseases other than tuberculosis not responding, while thirty-four of the thirty-six cases with tuberculosis gave distinct reaction, the negative cases being instances of virulent infection. This experience, therefore, corresponds to that of Arloing and Courmont. Besides these

investigations of blood serum, Courmont has carried out the reaction with the fluid from fourteen cases of pleurisy with effusion, eight of ascites, one of effusion in the knee-joint, and one of meningeal exudate. In eighteen cases the effusion was due to tuberculous disease, and in only one instance did the fluid fail to give a reaction. The non-tuberculous cases were all negative.

So far, then, as clinical investigations have been carried, all are strongly in favor of the value of the test, except those of Dubard. This author states that he considers the test of relatively little value, but his report is not clear as to details, and it is impossible to determine definitely his reasons for the statement.

A fact which early impressed itself upon Arloing and Courmont was that there were occasionally rather curious results—that repeatedly persons who had such mild grades of tuberculosis that the disease was scarcely discoverable clinically gave reaction in high dilution, while others who were severely ill reacted only in low dilutions or not at all. Arloing and Courmont investigated the reason for this by choosing animals of different species and different degrees of natural immunity to tuberculosis and inoculating them with bacilli of different degrees of virulence and with material from different tuberculous lesions. They learned that it is possible to produce agglutination in the blood serum in all animals investigated, and that the agglutinating power may be developed by different methods of inoculation and by different forms of cultures. But there are definite variations in the readiness with which the agglutination appears. The agglutinating power varies enormously in the first place in proportion to the virulence of the cultures or material inoculated. Weak cultures, for instance, always produce a marked agglutinating power in the dog, guinea-pig, and rabbit, while virulent cultures produced much less marked agglutinating power or none at all. In the cow and goat reaction was obtained after injecting virulent cultures, but the highest reaction was obtainable with the attenuated cultures. In general, the animals reacted in the following series: the dog best, next the rabbit and the goat, then the cow and the guinea-pig. It was evident that the variations in agglutinating power after inoculations depend chiefly upon the resistance of the species to tuberculosis. The guinea-pig, which is most subject to tuberculosis, is also the animal in which agglutinating action is least readily produced, and in general it shows the lowest power of agglutination. On the contrary, the goat, which is very refractory, shows agglutination even after injection of very virulent cultures. The dog, which is moderately susceptible, does not show agglutination after virulent infection, but shows a very high agglutinative power when suffering from mild tuberculosis. The intensity and frequency of agglutination is, therefore, in inverse relation to the virulence of infection and in direct relation to the resistance of the animal infected. There may be other factors which affect the reac-

tion, as the manner of introduction of the infective material, the primary locations of the lesions, associated infections, and the like. There is also to be noted an interesting variation in the rapidity with which the agglutinating power appears. The latter may prove to be of importance in drawing conclusions from the serum diagnosis.

These results indicate that one may expect, in human subjects, that poorly marked reactions or none at all will be seen in those who are suffering from a very severe or virulent infection, and perhaps in those who are excessively susceptible. Experimental work on animals, therefore, gives results entirely similar to those obtained by Arloing and Courmont in working on human subjects, and the same inverse relation between the intensity of infection and the strength of the reaction has been observed by all other workers. It is suggested by Arloing and Courmont that in human subjects as well as in animals it may be demonstrated that agglutination takes place more readily when the bacilli used in the test are homologous to those causing the infection—a very interesting idea and one that may prove very important if the test ever comes to be of decided clinical value.

A review of all this work leads one to conclude that whatever the clinical value of the method may prove to be it deserves to be tested more widely. Undoubtedly the preparation for the work requires a great deal of care and patience, and disheartening failures are likely to be met with in accustoming one's self to the work, particularly in the preparation of proper cultures. This is seen in the fact that all those who have investigated the method, excepting Dubard, have used the culture originally prepared by Arloing and Courmont, and we are led to suspect that others have made ineffectual attempts to prepare satisfactory cultures. But the method would be of enormous value if its general use could be secured and if results proved satisfactory. It requires a laboratory and a skilled bacteriologist; but in this country probably this would not lessen its value to any great extent, even to general practitioners without hospital connections, as our health board laboratories could do the work for them. The aid that it would give the profession in general, if it proved a reliable method, is evident, and the importance of the question would seem to demand efforts to determine its value definitely and to put it at the service of the clinician.

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REVIEWS.

PULMONARY TUBERCULOSIS. ITS MODERN PROPHYLAXIS AND THE TREATMENT IN SPECIAL INSTITUTIONS AND AT HOME. Alvarenga Prize Essay of the College of Physicians of Philadelphia for the year 1898, revised and enlarged. By S. A. KNOPF, M.D. (Paris and Bellevue, N. Y.); Physician to the Lung Department of the New York Throat and Nose Hospital; Former Assistant Physician to Professor Dettweiler, Falkenstein Sanatorium, Germany; Vice-President of the Pennsylvania Society for the Prevention of Tuberculosis; Fellow of the American Academy of Medicine; Laureate of the Academy of Medicine of Paris, etc. With descriptions and illustrations of the most important sanatoria of Europe, the United States, and Canada. 8vo. Pp. 332. Philadelphia: P. Blakiston's Son & Co.

THE essay to which the Alvarenga Prize was awarded forms a volume of 332 pages, freely illustrated and containing much material that could with difficulty be found in any other publication, and which is invaluable to one coming much in contact with tuberculous patients. In his introduction, which is a very modest expression of the hopes of the author, the opportunities which have been enjoyed by Dr. Knopf in the study of his subject are briefly mentioned. Few men have had the opportunity and have taken the trouble to investigate the subject of the various sanatoria for tuberculosis in such a thorough manner, and in reading the book one is impressed with the fact that the author is thoroughly familiar with that of which he speaks, and that the statements which are made in regard to the various institutions mentioned are founded upon actual experience by a careful observer. As an instance of the thoroughness with which the author has accomplished his task, mention might be made of the fact that the question of the use of the various sputum-cups is thoroughly discussed and many other supposedly minor matters are carefully considered. The same care is taken in regard to all of the apparently slight hygienic details. This precision and thoroughness are noticeable throughout the whole book, and make one of its most valuable features.

There are so many prominent questions at the present time in regard to tuberculosis that it is interesting to see what views are held by a man who has made a particular study of this infection. In Chapter V. the question of registration of tuberculous patients is discussed, and, while the author evidently is himself in favor of the compulsory notification of tuberculosis to the municipal authorities, he considers that the time is not ripe for any statutory action to be taken. With this I think the vast majority of general practitioners, as well as the less radical of the tuberculosis specialists, will agree. Directions for limiting the spread

of tuberculosis in the absence of notification are given with a completeness seldom seen. The author lays particular stress upon the danger of the propagation of the disease through infection of the railroad cars carrying patients to the various health resorts. This danger is undoubtedly one that should not be lightly treated either in regard to tuberculosis or to any of the other major infections. It would seem as though in the progress of sanitary science some further preventive measures should be made compulsory when we consider that it is perfectly possible for a diphtheria patient to travel for two consecutive days and nights in a Pullman sleeping car, suffering from a virulent attack of diphtheria, without any attempt being made to protect those afterward occupying the same berth from contracting the disease. Such an instance has come under the reviewer's notice within the last few weeks. Of course, it is impracticable to enforce disinfection of sleeping cars after each journey; nevertheless, it would seem that disinfection with formaldehyde at intervals would prevent the accumulation of poisonous materials such as can be presumably taking place in the stuffy sleeping cars as at present arranged. The statement by the author, that directions have recently been issued for disinfecting the Pullman cars is one that must be gratifying to physicians. Of course, the importance of this is especially great where large numbers of patients suffering from one infection are repeatedly occupying the cars running to a particular point, as is the case with tuberculosis.

The question of the presence of bovine tuberculosis and of measures that have been, are being, or could be taken to prevent its extension is well discussed.

One of the most valuable features of the book is a description of the most important sanatoria and special hospitals for the treatment of consumption in Europe and in America. While it would be desirable for all of us to have been able personally to inspect the various health resorts and sanatoria to which we recommend our patients to go, such a personal knowledge is impossible to most of us, and we all must feel at times as though our directions to patients in regard to changes of climate (the most expensive prescription ordered by us) was made without a sufficiently accurate knowledge of the various ingredients of our prescription. The details given by Dr. Knopf will lessen this feeling to some degree, as in his description of the various sanatoria details as to the surroundings, character of the buildings, and internal arrangements are given with great care.

The use of the pneumatic cabinet, hydrotherapy, and of selection of diet are well considered. Symptomatic treatment receives careful consideration. The lately introduced morphine derivative—heroin—is strongly recommended. This would agree with the experience of most of us that in this drug we have a valuable symptomatic remedy with fewer disadvantages than any of its predecessors. Another point that is of interest in this section of the book is that the author recommends the use of counter-irritants. It seems to the reviewer that in the praiseworthy seeking after rational methods of treatment some of the older methods are being too completely abandoned. Among these undoubtedly should be reckoned the use of counter-irritation. How it acts we of course do not know, and we may never know, yet undoubtedly the application of small blisters, or what is preferred by Dr. Knopf, igni-

puncture, not only is capable of relieving discomfort and of quieting various symptoms, but also appears to be capable of delaying, stopping, or favorably influencing the pathological processes going on beneath. In the treatment of hemorrhage from the lungs ergot is strongly recommended, as is also gallic acid. Whether the first of these has a beneficial influence, a deleterious influence, or no influence at all, is a question upon which there is little accord. It would seem that if ergot does not do good in pulmonary hemorrhage it must certainly do harm, and it seems to the reviewer that there is ample evidence of its having the latter effect. The use of gallic acid in pulmonary hemorrhage probably could not do harm ; it is difficult to see how it could do any good. One of the most important questions at the present time is the use of tuberculin as a diagnostic means. While there are many whose opinion is of value who use and recommend the use of this means of diagnosis, the reviewer has always felt that while it was of great advantage to have such a means of diagnosis of tuberculosis in the lower animals, its use in the human subject was not justifiable. Knopf holds the same view, and also is emphatic in condemning the use of any of the so-called curative sera. He has, however, employed with apparent good result antistreptococcic serum to combat secondary infection.

The impression made on reading Dr. Knopf's book is that the outlook for tuberculous patients is far more favorable than is generally believed. Not that the curability of tuberculosis is not generally recognized by the profession, but that most of us have hitherto not realized that we have at our command at the present time so many well conducted sanatoria and special hospitals, and not only so, but that the results of treatment at these sanatoria are so excellent.

On reading the book one feels that he is getting the views of an impartial observer carefully seeking after the truth, and its careful perusal is strongly advised, not only to those particularly interested in the study of tuberculosis, but to the general practitioner, who, after all, is the one who first sees the patient and upon whom rests the responsibility of its early diagnosis and its proper treatment. A word should be said in regard to the awarding of the prize to this essay. At the present time bacteriology and the study of the action of micro-organisms upon the human body is such an attractive field that many would hesitate to offer for a prize an essay dealing with subjects other than these. That the prize committee should honor such a book as that before us is an evidence that practical medicine and treatment are not being too much forgotten in the commendable search after the causes and more minute results of disease.

F. A. P.

RAYNAUD'S DISEASE: ITS HISTORY, CAUSES, SYMPTOMS, MORBID RELATIONS, PATHOLOGY, AND TREATMENT. By THOMAS K. MONRO, M.A., M.D. Glasgow: James Maclehose & Sons, 1899.

RAYNAUD'S disease has become quite generally known in recent years, though no English monograph of importance has previously been written. The disease was first described by Maurice Raynaud in

his Inaugural Thesis, published in 1862, but was not very generally recognized even by medical authorities until the appearance of his "New Researches," published in the *Archives Générales de Médecine*, 1874. Between these two publications Raynaud contributed an article on "Gangrene," in the *Nouveau Dictionnaire de Méd. et de Chir. Pratiques*, in 1872, in which he reviewed quite thoroughly the subject-matter of his previous thesis, and quoted very largely from it. In his thesis, Raynaud collected cases of obscure and spontaneous gangrene reported in the literature, and called attention to the fact that though numerous cases had been reported of gangrene following infections and other diseases, a variety could be distinguished by its involvement of the extremities, the nose and ears, by its symmetrical distribution, by the absence of disease of the bloodvessels, and he suggested that the fundamental cause is a disturbed innervation of the capillary vessels. The occurrence of spontaneous gangrene under the influences of nervous disturbances had indeed been recognized by Zambaco in an article published in 1857 under the title "De la Gangrène Spontanée produite par perturbation nerveuse," and Raynaud did not fail to give credit to this author. Zambaco, however, had not recognized the essential features in Raynaud's disease, and his previous publication does not in any way affect the merit of Raynaud's work. Raynaud recognized three stages in the disease or clinical syndrome described by him. In the first stage the affected parts, usually the same finger or fingers of either hand, become white and cold from contraction of the capillary bloodvessels. To this stage he applied the term "local syncope." Subsequently he recognized and admitted that the larger vessels also share in the spasm. In the second stage of the disease the affected area becomes deeply congested, sometimes dark-purplish in color, the previously depleted area now being engorged. The temperature, at first normal, sinks as the stasis increases in duration. To this stage he gave the name of "local asphyxia." Finally, in the third stage, dry gangrene develops, and the phalanx or a whole finger or the tip of the nose or ear may be lost. In the record of the earliest case, that reported by Lachmund in 1676, it is stated that Bernhard Shrader, a student of surgery, travelling with companions in 1629, learned of a case in the person of a daughter of his host at a small inn. The girl had suffered with considerable pain in her fingers and toes, and in the tips of her ears and nose, and there had been swelling of the affected parts, followed by mortification and dropping off of little pieces without any signs of decomposition. The father of the patient showed Shrader a box in which he had stored away during three years one hundred or more small pieces of the tissue that had fallen off. The three main features—syncope, asphyxia, and gangrene—and the symmetrical occurrence of the involvements mark Raynaud's disease as a distinct type. Later investigations into the etiology have added comparatively little to the facts brought out by Raynaud himself. The effect of cold in developing the condition in the beginning and in determining subsequent attacks is recognized now as it was by him. Constitutional conditions, especially neurotic affections, undoubtedly stand second in importance, and certain other diseases, like malaria, gout, syphilis, and diseases of the generative organs, especially in women, must be ranked as important influences. The disease is more common in the female sex, and is favored by exposure and emotional disturb-

ances. The author of the work under review has collected 180 cases, and finds that of the 145 recorded in English, French, and German periodicals, 81 per cent. are in journals in the English language. Considering that it is probable that these figures exaggerate the differences in liability of different nations, the author took the names appearing in the bibliography and found that British authors constitute 44 per cent., while 59 per cent. of all wrote in the English language.

The recognition or diagnosis of Raynaud's disease requires a preliminary determination of the features which characterize this disease. Local vascular disturbances sometimes terminating in necrosis or gangrene are met with in several conditions, including frost-bite, ergotism, senility, atheroma, diabetes, hysteria, and peripheral neuritis, and the vascular phenomena without gangrene may be simulated by congenital cyanosis, cardiac disease, and erythromelalgia. In none of these conditions, however, are the three peculiar stages, the paroxysmal character, and the symmetrical involvement noticed. Further, however, it is necessary to recognize that Raynaud's disease does not invariably present the three stages, some cases terminating with the stage of syncope, others advancing to asphyxia, the rest increasing to the stage of gangrene. In a table comprising 176 cases, Monro found three cases with local syncope only; twenty cases with syncope and local cyanosis, and sixty-six cases in which necrotic or sclerotic processes were added to the local syncope, and generally, though not always, after the super-vention of the second stage of local cyanosis. In twenty-eight cases local cyanosis alone was observed, and in fifty-six cases necrotic changes or sclerosis of the tissues followed the cyanosis without a previous stage of syncope. The author, however, has excluded the condition designated as "dead fingers." Undoubtedly this is a phenomenon which may occur in healthy individuals, but Raynaud's disease is also a condition which may occur in otherwise entirely healthy persons. The author very properly recognizes that Raynaud's phenomenon is but an increase of normal condition; a hyperactivity of the normal vasomotor processes—an activity which is set into operation with less marked causes and advances to more serious results than would be the case in the normal person. This being the case, it is clear that every grade of severity of symptoms may be observed, beginning with the normal individual at one end, involving such conditions as dead fingers, tendency to local syncope, etc., and terminating with the most pronounced types of Raynaud's disease.

As a provisional classification of the pathology of the disease, the author gives the following:

Raynaud's Disease:

- (a) Due to inherited peculiarity.
- (b) Due to acquired peculiarity.
- (c) Due to morbid blood state.
- (d) Part of a wide-spread neurosis (congenital or acquired.)
- (e) Associated with structural disease of the central nervous system.

Raynaud's Phenomena:

- (a) Due to a morbid blood state.
- (b) Due to a concussion or other lesion of the central nervous system.
- (c) Due to inflammation or other lesion of the nerves.

The author regards the disease as essentially paroxysmal, and excludes cases of non-paroxysmal, rapid multiple gangrene from either the group of Raynaud's disease or Raynaud's phenomena. The classification is satisfactory in so far as it distinguishes between the well-developed disease and the larval forms which are spoken of as instances showing the phenomena, but no practical usefulness is derivable from this or any other classification that has thus far been given. The most important points in the pathology of Raynaud's disease, namely, the exact condition or conditions of the central and peripheral nervous system and the actual conditions of the bloodvessels remain to be settled. Inflammatory and degenerative lesions of the peripheral nerves and changes in the central nervous system have been described, and in some cases it has seemed certain that the nervous lesions have been concerned in the production of the disease. Other equally typical cases have occurred without any such involvement of the nervous system. In either group of cases, vascular changes have been found or have been wanting, so that the actual conditions still remain uncertain, and there may be behind the vascular and nervous changes certain morbid conditions of the blood or tissues not as yet determined.

The review of the literature and the study of the disease as given in Monro's book are eminently satisfactory to the student who wishes a comprehensive discussion of the publications upon this disease, and for the most part the material is presented in a carefully classified way. There has been, however, some perhaps unnecessary repetition under the head of pathology and morbid relations which could have been avoided without detriment to the completeness of the work. A. S.

CLINICAL DIAGNOSIS. THE BACTERIOLOGICAL, CHEMICAL AND MICROSCOPICAL EVIDENCE OF DISEASE. By RUDOLPH V. JAKSCH. Fourth edition. Revised and enlarged by the author from the third English edition of the translation by JAMES CAGNEY, M.A., M.D. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Co., 1899.

VON JAKSCH has himself gone over this edition, owing to Dr. Cagney's death, and has added the new points which seemed important in order to bring it up to the times. Certainly this is the most valuable book in existence for the purposes for which it is intended; it is the most complete, and it has the advantage of being written by an author who has had an enormous personal experience, and has for years had the assistance of a large corps of actively working assistants. The value of the book has been so well demonstrated that it does not need to be insisted upon; it is only necessary to note the degree of thoroughness with which the review has been carried out. So far as the additions are concerned, they may be said to be wholly satisfactory, but the same cannot be said unreservedly of some of the things that have been allowed to remain. It seems to be a rather curious instance of personal obstinacy, as opposed to a real scientific spirit, to persist in calling albumo-

suria peptonuria, and merely to explain that the bodies spoken of as peptones are chemically albumoses. It is also decidedly incorrect to state that the xanthin bases of the urine are best estimated by the process of Krüger and Wulff—a method which is recognizedly untrustworthy and has been wholly replaced by that of Salkowski. These are examples of a few points in the book which are distinctly at variance with what recent work has proved to be correct. Such errors or evidences of personal disagreement with established teaching are not numerous, however. The fact which seems most strikingly evident in going over the new edition is that a wholly complete revision would be a very great improvement. This work has repeatedly been partially revised during a long series of years, but the advances in the methods of clinical laboratory investigation have been so enormous and old methods have been so frequently found to be inefficient that the book as it now stands is too conglomerate a mass of valuable methods, new and old, mixed in with methods and descriptions which are recognizedly worthless and antiquated. This makes it rather interesting than otherwise to one who has already some skill and a good deal of knowledge of the value of the procedures described, but it certainly detracts very largely from its value to the student, or to one who is entering upon the use of clinical laboratory methods, as he frequently finds himself wholly lost in his confused attempt to choose the proper one of the many methods described. The book would be far more valuable if it were completely revised and obsolete methods were either entirely cast out or were stamped as valueless, and retained merely for historical interest; clearer and more direct advice should then be given as to the proper choice of methods for definite purposes. This is all said with a full recognition of the great value of the book as it now stands, and with due honor to the author for having provided the profession with what is probably the most important work of its kind now existing; it is said merely because of personal knowledge that young investigators are oftentimes confused by consulting the work rather than aided in carrying out their purposes. This is apparently due purely to the fact that there is too much of the old mixed with the new, and there is not sufficient clearness in the advice as to the method to be chosen.

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PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

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Obliteration of the Hepatic Vein.—CHIARI (*Wiener klin. Wochenschrift*, 1900, No. 7) reports a case with some unusual features from Pribram's clinic. The patient was a man, aged twenty years, who had frequent attacks of diarrhoea and abdominal pain since childhood. Syphilis could not be traced in the anamnesis. Following the eating of spoiled fruit an acute attack of pain and diarrhoea came on, with distention of the abdomen. Ascites, œdema of the lower extremities, slight icterus, and bilateral hydrothorax ensued; there were multiple hemorrhages, and death occurred from œdema of the lungs. The autopsy showed a liver of normal size. Most of the organ was deep red, the acini unrecognizable. In this part the hepatic veins were thrombosed, their walls thickened. The mouths of the main branches of the hepatic vein were completely occluded in the intrahepatic part of the vena cava, but below that some of the smaller veins were open. Chiari thought the obliteration of the main branches had taken place in early childhood from endophlebitis obliterans, and that the last illness was due to thrombosis of the radicles of the hepatic vein. The cause was probably hereditary syphilis, and the case is much like one reported by Chiari in Ziegler's *Beiträge*, Band xxvi.

Clinically the case was interesting, partly on account of the absence of enlargement of the spleen and liver and the presence of ascites. The possibility of tuberculosis of the peritoneum was suggested by the history of abdominal pain, the family history, the cough, hoarseness, and intestinal hemorrhages. There was also renal hæmaturia. In one case with similar symptoms laparotomy was performed with the idea that there was tuberculosis. In some cases the ascites has been excessive, with rapid reaccumulation after tapping. Pribram looks on the sudden reappearance, after a long interval, of

the abdominal symptoms, with hepatic ascites, as of great significance. At present the diagnosis of hepatic thrombosis cannot be made with certainty, but has to be considered when such symptoms as those mentioned are present.

Angina and Endocarditis.—ROEGER (*Münchener med. Wochenschrift*, 1900, No. 8) has analyzed the relations in 120 cases of non-diphtheritic angina, and excluding cases with arthritis. There was no particular relation between the subvarieties of angina in their relation to heart murmurs. Herpetic tonsillitis seemed unusually frequent in this series, being observed in 13 out of 24 cases with heart murmur. In five of the cases there was herpes labialis. Of 10 cases the murmur developed after admission on the second day in 4, on the third in 4, and on the fourth in 2. In nine cases with murmurs on admission, these became louder during the course of the observation. In 5 in which the murmur appeared after admission, it disappeared before the patients were discharged, and in the other 5 persisted after the cessation of other symptoms for from seven to thirty days; on the average, seventeen days. In 14 cases with murmur on admission and a history of palpitation in the beginning of the angina the murmur persisted in 10. The murmur was most distinct at the apex in most cases; in some in the fourth left inter-space. All the patients were young (sixteen to thirty years), most of them women; the six male patients were all slender and anæmic. The author concludes from the large proportion of persistent murmurs that there was a genuine endocarditis or valvulitis. In one case the patient was discharged with murmur persisting, and returned five weeks later with increase of the cardiac symptoms, followed by a thrombus in the leg.

Epileptiform Convulsions in the Convalescence of Typhoid Fever.—MÜHLIG (*Münchener med. Wochenschrift*, 1900, No. 7) saw this rare complication in a man, aged twenty-three years, of strong constitution and previously well, and with no history of nervous or mental disease in the family. During the fever the patient slept much and was frequently delirious at night. In the first week of the disease there was a sudden and unexplained fall of temperature, rapidly rising again. On the twentieth day of convalescence, the patient having been in bed all the time, and on soft diet, an epileptiform attack occurred. Clonic spasms began in the outer fingers of the left hand, passed on to the left eyelid, and then became general, lasting half an hour. The pupils were dilated and did not react. Three hours later there was another similar attack, lasting twenty minutes; about five hours later one lasting ten minutes, both coming on in the same manner as the first. Six hours later a final attack appeared and continued, with interruptions of from one to five minutes, an hour. Between the attacks the patient felt comparatively well, but during and after that time he complained for ten days of numbness and formication in the two outer fingers of the left hand. The urine and heart showed no abnormality. The author leaves it open whether there was an embolus or an acute anæmia of the brain.

Actinomycotic Liver Abscess.—LITTEN (*Deutsche med. Wochenschrift*, 1900, No. 4, Ver.-Beilage, 3) reports an interesting case of this kind. A woman, aged thirty-nine years, had vague symptoms for one year, but was able to do

her work up to the time of admission to the hospital. At that time she had marked ascites and a small granulating ulcer at the umbilicus. Examination of the watery secretion of the latter showed many actinomyces, recognizable by the naked eye as small friable granules. A fistulous tract extended an indefinite distance from the ulcer. Just as preparations were being made for drawing off the fluid in order to permit palpation of the abdomen, acute peritonitis developed and soon ended fatally. Autopsy showed that the fistula led up to the liver, ending in an abscess the size of a fist in the right lobe. The liver abscess differed from the usual forms of that disease, inasmuch as the whole liver was converted into a tough sponge-like mass, filled with thick, tenacious pus. The latter contained actinomyces. No sign of the origin of the disease could be discovered. The teeth were carious, but showed no special lesions. There was a small actinomycotic focus in the right ovary.

Cervical Polyarthrititis.—VON JAKSCH (*Prag. med. Wochenschr*, 1900, Nos. 4 and 7) reports the case of a lad, aged sixteen years, who, from his seventh to his fourteenth year, had annually an attack of rheumatism. In his fifteenth year he noticed that swallowing and all movements of the neck became painful. A tumor formed in the neck, and the mobility of the latter lessened steadily; burning and increasing weakness of the right arm came on, later similar symptoms in the right leg. Examination on admission showed evidences of mitral and tricuspid endocarditis and an inflammation affecting the first three cervical vertebræ. The head was kept immovably inclined to the left and turned to the right. There was a depression in the pharynx, opposite the uvula, dislocation of the upper cervical vertebræ, and a painful fluctuating tumor beside the latter. There was spastic paralysis of the right arm, without reaction of degeneration. There was uncertain gait, the reflexes were increased, with ankle clonus. Hypertrophic pachymeningitis consecutive to caries of the vertebræ was suspected. Later the left arm became paralyzed, sensation was delayed, especially in the left side. Curious reflex spasms set up by the great occipital nerve then began, along with paræsthesia in the hands. Walking became impossible, and slight touching of the head and neck brought on clonic spasms. After a year motion returned in the arms, interrupted in the beginning by periods of paresis. About this time evidences of irritation in the left sympathetic appeared, with left-sided sweating of the face, and dilatation of the pupil and palpebral fissure. Soon after this motion returned in the cervical articulations, with crepitus, the swelling subsided, the paralysis of the arms lessened, and the patient could even stand and walk; the reflexes were less intense. An attack of tonsillitis with fever was followed by increase of the spastic symptoms and the paresis. Herpes appeared in the distribution of the left inferior cervical nerve, and irritation there brought on spasms of the left leg. The condition improved, so that only stiffness of the neck and atrophy of the deltoids remained, but more than two years after the first admission the patient died from rapidly increasing loss of compensation. The autopsy revealed double lesions of the mitral, aortic, and tricuspid valves, with hypertrophy, pericardial adhesion, and secondary alterations of various organs, with ankylosis of the occiput and first three cervical vertebræ, compression of the medulla and descending degeneration of the cord. In the absence of tuberculosis and

gout, and in view of the history, the ankylosis could only be explained by a rheumatic affection.

The Diagnosis of Beginning Tuberculosis by the Sputum.—BRIEGER and NEUFELD (*Deutsche med. Wochenschrift*, 1900, No. 6) emphasize the importance of sputum examinations as part of the early detection of tuberculosis. They properly point out the necessity of special training and practical experience, and the uselessness of a single negative examination. Not only tubercle bacilli, but other bacteria, the possible causes of mixed infection, must be searched for. Moreover, the clinical findings must be carefully worked out, since it is only by the combination of clinical and bacteriological facts that diagnosis and prognosis can be made. The authors also insist on the tuberculin test in all doubtful cases, and, on the ground of the extensive experience of the Institute for Infectious Diseases, assert its safety and certainty. Some interesting case-histories are given in abstract, illustrating the points claimed by the authors. The influenza bacillus and the pneumococcus are among the most important agents in mixed infection, not only in cases with severe symptoms, but also in those with an insidious, even afebrile course. The danger of infecting others in institutions is one that must be borne in mind in connection with such cases. Brieger and Neufeld also suggest that some cases of healed apex catarrh are really cases of pure influenza-bronchitis. Among the cases cited is one of tuberculosis with severe hemorrhages, in which bacilli were not found until three months after admission. The hemorrhages continued, but bacilli persisted in the sputum. Another case is given in which distinct physical signs and tuberculin reaction were present, and yet in over five months' observation tubercle bacilli could not be found. In another case for a long time there were influenza bacilli, but no others.

[The authors' remarks are timely. The idea of mixed infection is taking hold of part of the profession in a way that can only do harm. It is not uncommon to hear of contaminated sputum sent by mail, examined by a pharmacist, and "streptococci" or "staphylococci" found. In the former case antistreptococcus serum is used without reference to the condition of the patient. It must be made clear that the examination for mixed infection requires time and skill, and that even when made the other clinical examination must be properly made and carefully interpreted.—G. D.]

The Blood in Cancer of the Stomach.—KROKIEWICZ (*Archiv für die Verdauungs-Krankheiten*, Band vi., p. 25) has examined this question with results that bear out those of most other observers, and are valuable in that way. As regards the number of red corpuscles, he confirms the observations of Henry, Stengel and others, finding in seventeen cases that the corpuscles were only once as low as 1,856,000, usually between two and three millions, the hæmoglobin between 30 and 50 per cent. In two cases, with 6,360,000 and 4,800,000 corpuscles, uncontrollable vomiting explained the condition by a concentration of the blood—a fact that also explains the relatively high counts (as compared with the cachexia) in the other cases, and seems better founded than the author's view that the high count is a sign of metastasis in the peritoneum. Of the seventeen cases thirteen showed no

digestion leucocytosis, so that the author shares Löwit's opinion that this sign has about the same value as absence of HCl and presence of lactic acid. In almost all cases the alkalinity of the blood was lessened. The author ventures on an explanation of the nature of cancer cachexia, inclining to the view of Pilliet, that it is the result of intoxication with by-products of the metabolism of the cancer cells.

Respiratory Changes of the Lung Resonance.—AUFRECHT (*Deutsches Archiv für klin. Med.*, Band lxx. p. 622) calls attention to the value of this sign in certain pathological conditions. Normally the lung in expiration gives a sound that is full and low, in inspiration one that is high and less resonant, the differences being observable over all parts of the thorax. In case of a small focus of infiltration the percussion results are reversed. The sign is useful not only in determining the existence, but also the extent of an infiltration. In croupous pneumonia similar changes occur, and the sign may therefore be useful in distinguishing between it and pleurisy with effusion, especially in cases in which vocal fremitus is unavailable by reason of hoarseness or paralysis of the vocal cords. The explanation of the phenomena in cases with small infiltrations is easily made by recalling the effect of such changes on the resonance and elasticity of the lung tissue. In pneumonia increase of air in the finer bronchi and the uninvolved alveoli may explain the change.

The Atactic Form of Alcoholic Polyneuritis.—VON HÖNIG (*Deutsches Archiv für klin. Med.*, Band lxxvii. p. 123), in reporting a case, gives an interesting study of the subject, with copious references to the literature. Details must be consulted in the original. The author's conclusion regarding the pathogenesis of the disease is that its purely peripheral character can no longer be admitted, partly for anatomic, partly for clinical reasons, such as ataxia, psychic disturbances, and spasms. On the other hand, the participation of the brain, especially the cortex, is not yet demonstrated, but highly probable, while the affection of the cord is certain.

Acute Hemorrhagic Myelitis in Typhoid Fever.—SCHIFF (*Deutsches Archiv für klin. Med.*, Band lxxvii. p. 175) reports a case of this kind, fatal in eighteen hours, in a man, aged nineteen years. It began on about the ninth day of the disease. The symptoms were those of an acute ascending (Landry's) paralysis, incontinence of the bladder and rectum preceding the other symptoms by several hours, and followed by complete motor paralysis of the lower extremities, with loss of reflexes, and incomplete paralysis of the arms. The mind was clear, the cerebral nerves intact. There was complete anæsthesia for all sensations in the extremities, the abdomen and thorax, sharply limited at the level of the third costal cartilage and second dorsal spinous process. There was also paradoxical respiration, the diaphragm alone acting, pulling down the lower part of the thorax and pressing forward the relaxed abdominal muscles. The lesion was evidently at the level of the boundary between the fourth and fifth cervical segments of the cord. During the few hours of the disease a bed-sore the size of the palm developed over the sacrum. Lumbar puncture five hours before death gave a non-inflammatory and sterile

fluid, under high pressure. Autopsy showed intestinal lesions of typhoid fever in the second week. The spinal cord, at the level of the fourth, fifth, and sixth cervical nerves, was swollen, dark red and soft; the normal structure obliterated. Cultures were negative. The alterations in the cord were: Multiple, irregularly distributed small recent hemorrhages throughout the whole cord and for the greater part without evidences of congestion; hemorrhagic infarction in the lower part of the fourth cervical segment, destroying almost the whole gray substance in that part; great vascular dilatation in the fifth to the eighth cervical segments, with small perivascular hemorrhages; advanced degeneration of the ganglion cells of the anterior horns in the cervical portion, even in the parts not affected by hemorrhage or hyperæmia; swelling of axis cylinders and hyperplasia of the glia in the outer part of the white matter; extensive degeneration in the posterior columns, with exudation. In addition to its special clinical and anatomical interest the case is important as an example of a toxic myelitis in the course of an acute infectious disease.

The Effect of Kreatinin on Trommer's Test in Glycosuria.—NEUMAYER (*Deutsches Archiv für klin. Med.*, Band lxxvii. p. 195) has investigated the reason why glucose in urine gives an orange-red or yellow precipitate, instead of the bright red of a watery solution of grape-sugar, and why the precipitate in the case of the urine is amorphous, in the other crystalline, and also why the precipitate in the one case oxidizes rapidly on exposure to the air, while the other does not. Although it has long been known that in the one case the sediment is cuprous hydroxide, in the other cuprous oxide, no satisfactory reason has yet been advanced. Neumayer was led to an explanation by noting the effect of meat-extract on the reaction. Further investigation made it clear that kreatinin was the cause of the variation, and as in the case of glycosuria, the addition of an excess of alkali (converting kreatinin into kreatin) caused a red precipitate. The more remote cause of the difference probably depends on a reciprocal action of the kreatinin and glucose, the nature of which is not yet known.

Chronic Indurative Pancreatitis with Multiple Cysts.—POSSELT (*Prag. med. Wochenschr.*, 1900, No. 12) reports the following case as an addition to our scanty knowledge of pancreatic disease. A man, aged sixty years, previously well, began to complain of itching in the legs, and some months later became jaundiced, with dark urine and pale stools. On admission there was marked jaundice, slight emaciation. The liver was moderately enlarged, hard, the edge not palpable. In the right side, below the ribs, a round resistant area was palpable. The appetite was good. Edema gradually developed in the legs, and ascites appeared later. Puncture of the mass in the right side, supposed to be the gall-bladder, gave a clear, greenish fluid. Three months after admission the patient died suddenly, having had for some time loss of appetite, diarrhœa, and frequent polyuria. Autopsy showed the pancreas, especially the head, full of cysts, with smooth walls and milky contents, sometimes containing gelatinous particles. The pancreatic and common bile ducts were occluded. The liver and gall-bladder showed merely the results of obstruction. The clinical diagnosis of multiple

echinococcus cyst of the liver was certainly excusable under the circumstances, though the enlargement of the liver was not as great as usual in that disease, and the total nitrogen and urea were less than in the cases observed by the author. The absence of glycosuria (alimentary) was also an interesting feature in the case.

Löwit's Hamamoeba of Leukæmia.—Although Löwit's assertion of the finding of protozoa in leukæmic blood has been received with commendable skepticism, the claims made in his recent book (*Die Leukämie als Protozoenkrankheit*, 1900) are so explicit that they demand control. It is therefore interesting to learn of a criticism by W. Türk. Before Löwit's methods were known Türk believed the bodies described were either mast-cell granulations or artefacts of the latter. This was denied by Löwit, however, who claimed the mast-cell granules were not acid-resisting. Türk now says (*Wiener klin. Wochenschrift*, 1900, No. 13) that he has made controls by Löwit's method, and not only adheres to his earlier view, but has also made some interesting observations in the bodies in question. Using preparations fixed by heat, he finds that while concentrated alcoholic methylene-blue stains the granules a distinct violet, a concentrated watery solution causes a curious deformity of most of the granules, so that in the protoplasm of the mast-cells large or small, round, oval, angular, tape-like or even branching violet masses can be seen, along with occasional granules. There is evidently a partial solution of the granules caused by the watery stain, which is in proportion to the degree of dilution. Löffler's solution acts in the same way, but not to the same degree. The mast-cells of normal blood are more resistant to the action of the watery solution than those of leukæmia, but even then the so-called amœbæ can be demonstrated, and in rabbits' blood also the artefacts can be produced, though with difficulty. The criticism of Löwit's conclusions and animal experiments given by Türk is to the point, but hardly necessary to abstract.

Skin Manifestations of Influenza Observed in the Present Epidemic.—HERMAN (*New York Medical Journal*, February 17, 1900, p. 238), in a brief note on the influenza epidemic at present prevailing in Brooklyn, states that the disease is mild in character, but extremely infectious. Once it invades a house at least two or more members are attacked.

The respiratory, gastro-intestinal, and cerebro-spinal forms have all been seen. Herman draws special attention to the skin manifestations. He states that these eruptions are something new in the United States, but that they have been described in England and Continental Europe since the epidemic of 1890. The eruptions that he has most frequently seen have been those simulating scarlet fever, measles, and herpes.

The scarlatiniform rash has been frequently described in England. The eruption simulating measles resembles the papular form, and may be confined to the cheeks, or it may cover the entire surface of the body. The herpetic eruption has been frequently called urticaria, but Herman thinks that it is more properly called herpes. One of his cases had a typical herpes zoster, and infected two other children in the same family with a dissemi-

nated herpes. He has succeeded in demonstrating the presence of the Pfeiffer micro-organisms in his cases, but does not specify whether from the respiratory tract or from the herpetic lesions.

SURGERY.

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Anthrax of the Thigh Treated by Operation; Recovery.—SINCLAIR (*British Medical Journal*, March 31, 1900) reports a case of anthrax which is interesting, because the bacteriological source of the infection was very evident. The patient, a healthy laborer, while wheeling a barrow laden with bone manure, was accidentally pricked on the inner side of the thigh, in the lower third, by a splinter of wood on the barrow handle. Feeling something scratch him in this situation, he extracted a tiny slip of wood from his trousers and continued his work, taking no further notice of the occurrence, as the spot was not painful. In three days a pimple formed and became a sore, which grew daily larger and more painful. When first seen the characteristic signs were manifest—the central depressed black slough surrounded by a complete ring of vesicles. Inflammatory redness and swelling extended around for an area of seven inches by five, and very marked enlargement and tenderness of the femoral glands had recently supervened.

The area involved was freely excised and the glands removed. The bacteriological examination of the fluid from the blebs showed the bacillus anthracis. The fluid from the central part of the slough showed a few bacilli and many streptococci. The swollen lymph-glands contained no anthrax bacilli that could be detected. Inoculation into a mouse resulted in death in thirty-six hours, and showed anthrax in the spleen.

The Treatment of Irreducible Luxations of the Elbow.—LOISON (*Revue de Orthop.*, March, 1900) reviews two cases in which the luxation had existed for two and four months unreduced. There were contractions of the muscles, the torn lateral ligaments had been repaired in the new position, and there were possible adhesions between the anterior portion of the capsule and the humerus. The principal obstacle to reduction was, however, found in the callus which had formed in front of the joint, involving the deep fibres of the anterior brachial and triceps muscles.

The author derives the following lessons from the treatment of these cases. Shall the attempt be made in such cases to secure the restoration of the joint by massage and passive motion? In such cases as these it will not succeed, nor will forcible motion under an anæsthetic. The same is true of the subcutaneous resection of the fibrous adhesions. In such cases as these they would produce no good results, as there was newly formed bone which prevented the motion. The removal of the principal mass of callus was unavailing in the first case, and the author does not believe it worth the attempt.

An arthrotomy is valuable in a recent luxation that is irreducible; but in one of older date the author believes that the only resort that will give a chance of success is to perform a partial or complete resection.

A Loose Foreign Body in a Hydrocele Sac.—BENSON (*Lancet*, March 17, 1900) reports the case of a boy, aged fourteen years, in whom a hydrocele had persisted for some time in spite of three tapplings. Upon examination a hydrocele of about the size of a golf-ball could be detected. It affected the cord only, and was quite free of the coverings of the testicle. No communication could be detected in the peritoneal cavity. The operation showed the sac connected with the cord, from which it was freed. The furuncular process was not completely obliterated, so it was ligated and treated as a hernial sac. The hydrocele sac was removed intact. A small opaque body was noticed within it, and freely movable. The sac was opened and an ounce of clear fluid escaped. The foreign body proved to be a small mass of hard, fatty tissue. The outer part was somewhat loose in texture, very uneven, and somewhat nodular.

Observations on the Treatment of Cancer.—ROBINSON (*Medical Record*, March 31, 1900) summarizes his views in the following conclusions:

1. That at present we know of no drug, animal extract, serum, or toxin which, given internally by any avenue of the body, can be relied upon for the cure of cancer of any part of the system.

2. That the statement that the knife is the only reliable agent in the treatment of cancer is not correct.

3. That certain caustics, judiciously chosen and properly applied, may attack deposits of the growth inaccessible to the knife, and in these cases should be employed, even if the knife is necessary to prepare the way for their use.

4. That in some cases both the knife and caustics should be used, and in some other cases curettage, followed by a caustic, is the proper procedure.

5. That the majority of cases of cutaneous cancer can be removed with greatest certainty and with least deformity by caustics, provided the patients are seen before the lymphatic glands are invaded.

6. That the knife should be used when the lymphatic glands are invaded, and also in some other cases of external cancer.

The Cardinal Pathognomonic Sign of Fracture of the Lower End of the Radius (Colles).—WARE (*Medical Record*, March 31, 1900) calls attention to an old sign of Colles' fracture, which he considers the cardinal pathogno-

monic one. It is the sign of Langier, which he has found reliable in diagnosing 300 cases of fracture of the lower end of the radius that have come under his observation.

This sign is based on the relation of the ulnar and radial styloid. The styloid of the radius is at a lower level than the styloid of the ulna. This is always the case, normally differing in degree according to the development of the bones, being more marked in males than in females, less so in infancy. With the hand in the prone position and on the same plane with the bones of the forearm, this sign is most readily ascertained by then impinging the thumb and index finger against the styloids, and projecting a line between the two points, it will take an oblique course, slanting to the radial side.

An estimate of the existence of the levelling or elevation of the radial styloid should be the first manoeuvre in ascertaining a fracture, thus precluding any further manipulation until reduction is performed. It would suggest itself that this relation of the styloids ought to be an index to proper reduction; this is but relatively so, as an absolute restoration of the normal relation of the styloid is impossible in the greater number of instances. The presence of an altered relation in an old case indicates an old fracture.

Neoplasms of the Kidneys.—MCARTHUR (*The Chicago Medical Record*, March, 1900), in speaking of the treatment of these neoplasms, says that he prepared a paper to read before the society just prior to the announcement by McBurney of his method of separating the muscular fasciculi in entering the abdominal cavity. This method is equally applicable for approach to the kidney as well as to other abdominal organs. One will be surprised both by the room permitted and the perfect falling together of the parts after the operation, as well as by the speedy union.

Second, bitter experience has taught him that in nephrectomy, whenever possible, the renal pedicle should be temporarily clamped and cut. Only after removal of the tumor is it satisfactorily possible to treat properly the separate elements of the pedicle. Slipping of ligatures otherwise applied is prone to occur.

Third, on the right side avoid traction or occlusion of the vena cava. Even temporarily shutting off the returning blood-supply to the heart makes a dangerous, even fatal, shock. He had a death that occurred thus.

Fourth, never do a nephrectomy until sure of both the existence and functional capacity of the kidney on the opposite side. The urine on that side should not only be normal, but in sufficient amount. He nephrotomized a patient with an infantile kidney. The conclusion—normal urine, normal kidney—is not logical.

Fifth, study carefully the clinical history. He operated upon what proved to be a syphiloma of the kidney, but did not remove it. Recovery followed a study of the history and appropriate treatment.

Sixth, every renal operation that can be done without entering the peritoneal cavity is the safer operation, and should be selected.

Expanded Metal a New Splint Material.—HÜBSCHER (*Centralblatt für Chirurgie*, March 3, 1900) calls attention to this new building material as valuable and convenient for making splints. It can be made of any metal,

as aluminum, and with metal shears is easily cut into any desired form. The open, lattice-like form of the metal makes it yield readily and conform to the contour of the limb, and yet when bound in place it is very rigid. In dressing a leg the foot-piece is made by cutting the metal transversely nearly half its breadth on each side; it is then turned up along the sole of the foot, the cut ends interlocking into the leg portion of the lattice work. Angular splints of great rigidity are made in this way for any portion of the limbs or body.

When combined with plaster-of-Paris this splint produces exceptional rigidity, and yet can be made much lighter than a splint made in the ordinary way of plaster.

A Case of Rupture of the Rectum, with Recovery —ENGLAND (*Montreal Medical Journal*, February, 1900) reports the case of a little girl, aged twelve years, who fell from a piano-box upon a broom handle. The end of the handle entered the anus and penetrated the body to the extent of from twelve to fifteen inches. She succeeded with some difficulty in withdrawing the broom handle and went to the house. The family physician saw her and brought her seventy miles to the author, who saw her twenty-six hours after the accident. Her condition was unpromising. The face blanched and pinched; extremities cold; pulse small, weak, and rapid; temperature 101° F. There was also general abdominal tenderness, with fixation of the abdominal muscles, but there was no distention. There had been pain, though not of a severe character, and some vomiting; much loss of blood was also said to have occurred during the journey.

After the patient was anesthetized, the anus on inspection was found bruised and patulous and the surrounding skin ecchymosed. On digital examination (per anum) a large rent was discovered in the rectum, situated about three inches from the anal orifice, and through this opening the finger readily passed into the peritoneal cavity. The rectum was washed out; an artery was caught and ligated and the rectum packed with iodoform gauze. The patient was placed in the Trendelenburg position and the abdomen opened. The rectal tear was easily located after the grumous material found in the peritoneal cavity had been carefully sponged out. The tear was closed with a continuous and a mattress Lembert suture. Injection of normal salt solution and stimulation with hypodermics of strychnine and brandy were found necessary on account of the patient's exceedingly grave condition. After the operation the patient was kept for two hours in the Trendelenburg position, surrounded with hot-water bottles and blankets. The pulse, though very small and rapid, was still perceptible. For three days stimulants, heart tonics, and nutrient enemata were persistently employed. The pulse remained rapid and small for some time. At 4 P.M. on the second day the temperature rose to 101.6° F., but fell to 98.5° F. on the following day. Convalescence was very slow, but the patient finally recovered completely.

A Removable Deep Suture.—SCHOEMAKER (*Centralblatt für Chirurgie*, April 7, 1900, No. 14) describes a simple removable suture which overcomes the difficulties that have surrounded the employment of non-absorbable mate-

rials in uniting abdominal wounds layer by layer. It is nothing more nor less than the chain-stitch sewing of the older machines. A needle is employed having the eye in the point. It is carried through both sides of the wound and the loop caught. Without unthreading the needle it is withdrawn and the second stitch taken. This time and on each successive stitch the loop is carried through the last loop, thus locking it. The final stitch is carried out through the skin and the end pulled through the loop. When it is to be removed the end is withdrawn from the last loop by pulling on the thread, each successive loop is drawn out, and the whole thread is thus released. The thread can be drawn very tight without interfering with its removal, but rather facilitating it.

Vomiting Considered from Some of Its Surgical Aspects.—BENNETT (*British Medical Journal*, March 24, 1900) calls attention to the fact that many of the deaths that are attributed to anæsthetics are in reality the result of infection of the lungs by the inspiration of vomited matter while the patient is unconscious. Under these circumstances he points out the desirability, in all cases in which the administration of an anæsthetic is necessary, when there is any possibility (to say nothing of probability) of the stomach being a reservoir for offensive material or half-digested food, that the proper practice to adopt is stomach lavage, with the object of preventing the possibility of lung implication from the passage of portions of the contents of the viscus down the trachea.

There is also a form of late vomiting which comes on a few hours or a few days after the operation and threatens the life of the patient. It would not have occurred if the anæsthetic had not been administered, and is, therefore, a result of its employment. In cases in which there is reason to believe that the administration of an anæsthetic is likely to be or has been followed by very grave vomiting it is advisable to wash out the stomach thoroughly before the commencement of the operation, by which the tendency to subsequent vomiting may be altogether obviated; and, further, that vomiting of the ordinary kind which follows the administration of an anæsthetic may be frequently avoided by the same means.

The author reviews a series of cases that have led him to the conclusions that:

1. Feculent or stercoraceous vomiting occurs more commonly than is supposed in cases in which no mortal disease exists. The occurrence of feculent vomiting must of necessity be a grave symptom, but it is not always followed by death, even though nothing be done for the patient from a surgical point of view.

2. That in certain cases the vomiting is curative, inasmuch as it empties the bowel and stomach of accumulated contents, which for the time being are unable to find their way downward in the normal way. This view is supported by the fact that in the cases narrated a very copious and, as it were, final vomit immediately preceded the change of the patient from an apparently hopeless state to the commencement of recovery.

In reference to the question of determining whether recovery will take place without radical surgical measures, this depends for its value on one sign: this is the condition of the belly with regard to distention. If with

the continuance of vomiting there is persistent increase of abdominal distention, the condition is a mortal one unless radically relieved. If, on the other hand, with the continuance of vomiting there is no increase of distention, there is reason to hope that active interference is unnecessary and that recovery may follow "the casting off of the complaint" effected by the cleansing out of the stomach and intestines in the upward way.

The bearing of this point, if it is worth anything at all, upon treatment is obvious, especially in cases which, having been submitted to abdominal section, vomiting of the kind under discussion follows immediately after or comparatively remotely. The application of the point is this: If with vomiting there coincides increased distention, nothing can save the patient but reopening the abdomen with a view to the removal of the cause, if that is possible. On the other hand, should there be no increasing distention, operative measures may reasonably be deferred, since the chances of spontaneous recovery are good enough to negative the propriety of running the risk so serious as a second operation under the circumstances must entail. When no operation has been performed the practical bearing is the same, and the urgent necessity for operation or the reverse depends on whether there is or whether there is not increasing abdominal distention coinciding with the vomiting.

In conclusion, the matter may perhaps be comprehensively summed up in the statement that in cases of abdominal disease or injury, feculent vomiting, as such, is no positive indication for surgical interference unless it is accompanied by increasing abdominal distention.

A Case of Purulent Pericarditis: A Method of Opening the Pericardial Sac.—OGLE and ALLINGHAM (*Lancet*, March 10, 1900) report a case of purulent pericarditis in which the pericardium was opened, a large quantity of pus removed, and then cleansed without interfering with the action of the heart and with a decided benefit to the patient, with a relief of severe symptoms. The condition had, however, been left too long unrelieved. This was due to the difficulties in the way of diagnosis and to the lack of knowledge of the impunity with which the heart can be handled, not only without harm, but with positive and very evident benefit, as was shown by the remarkable improvement of the pulse in regularity, strength, and tension during the process of cleansing the heart.

The value of such intervention has suggested to the authors a method of operating, which they describe as follows: "1. An incision of about three inches in length, with the upper end at the costoxiphoid angle, is made along the lower edge of the seventh left costal cartilage; the latter is then exposed by separating the abdominal muscles from it; the cartilage can then be pulled somewhat outward and upward, when the fibres of the diaphragm become visible, together with the cellular interval between its attachments to the cartilage and to the xiphoid appendix. 2. This cellular interval is enlarged by cutting or tearing through the muscle of the diaphragm as far as may be necessary, when a mass of fat is usually seen just above the diaphragm, in the space between the pericardium behind, the sternum in front, and the diaphragm below. 3. This fat, together with the diaphragm, is pulled downward, when the pericardium presents itself and can be incised

or opened up with forceps at its lowest part in front, and a large hole being made, a finger inserted can explore the heart over its whole extent back and front, nearly as far as its extreme base. During the operation the peritoneum may be exposed as it sweeps downward from the under surface of the diaphragm. It is, of course, not injured, but is pushed aside as is done in performing a suprapubic cystotomy. The superior epigastric artery is not wounded, but can be kept well inside, toward the middle line, on separating the tissues after cutting through the attachment of the abdominal muscles to the seventh cartilage."

They claim the following advantages for this method: "1. The pleural cavity cannot be injured, as it is far away in the normal arrangement of the organs, and would be still further removed in pericardial distention. It would seem, indeed, that the method described is the only sure way of entering the pericardium without wounding the pleura, for the latter frequently covers the fifth and sixth intercostal spaces, even up to the sternum. 2. Drainage is from the most dependent portion of the sac, when the patient is half propped up, and is through a large opening not bounded by cartilage or sternum. 3. Great ease is afforded for the exploration and cleansing of the heart, both back and front, to its extreme limits."

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,
OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,
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Tetanus Successfully Treated with Antitetanic Serum.—HIBBERT (*New England Medical Monthly*, November, 1899, p. 427) reports a successful case. The patient was a boy, aged twelve years, whose feet were scratched by a wire fence. Five days later he complained of stiffness in the muscles of the neck and jaw, and on the following day was unable to open his mouth wide enough to permit the insertion of the little finger. There were sharp, shooting pains which extended from his legs upward to the back of the neck. He was very nervous and sleepless, and had a temperature of 100.5°, the pulse being 110. He was first seen on the sixth day after injury, and ten-grain doses of chloral were given. On the seventh day the symptoms were more aggravated. Ten c.c. of serum were given, and a second dose twelve hours later. A third dose of the same quantity was given after twenty-four hours.

Great improvement was observed the following day, and steadily continued, so that in six days all rigidity of the muscles had disappeared, and substantial nourishment was taken. The only alarming symptom during the period

of convalescence was a very irregular and frequent pulse, which was readily controlled by appropriate treatment, and in a few days more recovery was complete.

A Note upon Kernig's Sign in Infants.—FREDERICK A. PACKARD (*Archives of Pediatrics*, April, 1900, p. 259) reports three cases of verified meningitis in infants, two of whom were aged sixteen months and one four months, in which Kernig's sign was not present during life. He believes the sign to be of value in the diagnosis of meningitis in the adult and in older children, but is disposed to attach little importance to its absence in cases of distinct meningitic symptoms in infants. His observations so far have not permitted him to determine at what age the sign becomes more significant.

[We can confirm Dr. Packard's observation of the frequent absence of this sign in cerebral meningitis occurring in infants under two years of age.—ED.]

The Role of the Calcium Salts in the Pathogenesis of Rhachitis.—Recent researches having shown that rhachitis cannot be attributed either to an insufficiency of the salts of lime in the food, or to an inadequate absorption of these salts because of too rapid elimination by the rhachitic, STOELTZNER (*Jahrbuch f. Kinderheilkunde*, Band 1., S. 268) has undertaken to repeat the experiments of Brubacher, and has made a study of the body of a non-rhachitic infant and of four rhachitic infants to ascertain the proportion of the lime salts in the fresh tissues of the brain, lungs, heart, liver, and spleen. These researches have confirmed the conclusions of Brubacher in showing that in the tissues and organic fluids of rhachitic infants the lime salts are found as abundantly as in the non-rhachitic.

It follows, therefore, that the cause of the non-calcification of the osseous tissue of rhachitics should be sought in a particular condition of the bony tissue itself, and not in some peculiarity of the blood plasma with regard to the lime salts.

This conclusion is supported, besides, by the early experiments of the author, who showed that, when young animals are fed upon a diet entirely deprived of the salts of the alkaline earths, osseous lesions are produced which in no respect resemble those of rhachitis. In the former there is an insufficient formation of osseous tissue, while in rhachitis the formation of this tissue is normal, but calcification is deficient.

Lesions of the Kidneys in Congenital Syphilis.—HECKER (*Jahrbuch f. Kinderheilkunde*, 1900, Band i. (n. s.), S. 375) states that the renal manifestations of congenital syphilis have been little studied, and that this is the more surprising since in these organs the diathetic lesions can be better observed than in the liver. He has carefully studied the kidneys of ten dead-born syphilitic infants, and of nine syphilitic nurslings which lived for a short time, none beyond the age of three months. For control the same study was made of twelve dead-born infants, premature or at term, but free of syphilitic taint.

With the nineteen syphilitics the kidneys were affected in every case.

When the infant was prematurely born there was found a small-celled infiltration of the small vessels of the cortex and sometimes of the larger vessels of the medullary substance; almost always there existed at the same time a proliferation of the interstitial connective tissue, and, very often, an endoperiarteritis of the small vessels of the cortex. With the infants born at term the vascular and perivascular infiltration is less marked, but there are more or less distinct evidences of degeneration of epithelium. It is only in the infants that have lived for a time, and especially the nurslings, that parenchymatous lesions appear very distinctly. The epithelium is atrophied and shows fatty degeneration, with signs of desquamation of the cells and secondary dilatation of the urinary tubules, which contain hyaline and granular casts. The Malpighian bodies show evidence of inflammation and destruction, diapedesis of leucocytes into the capsular space, desquamation of the epithelium and proliferation of the capsular endothelium, with atrophy and fatty degeneration of the capillary tufts. The distinction between the renal changes in the syphilitic foetus and those in the nursling, as just described, is not always clearly marked, and intermediate types are frequent in both groups. The difference of the processes in the two groups is still further marked by another sign. The proliferating nephritis of the foetus produces an increase of weight of the kidneys (one eighty-sixth of the total weight of the body as compared with one one-hundred and twenty-third in the normal foetus), while in the atrophic nephritis of the syphilitic nursling the kidneys are diminished in weight, being one one-hundredth of the body weight as compared with one ninety-fourth in the normal infant.

Clinically, syphilitic nephritis of the nursling produces appreciable symptoms. Of the twelve cases studied, albumin was present in ten, often in notable quantity, with casts in great numbers.

Diphtheria of the Vulva.—E. E. WARE (*Lancet*, 1900, i. p. 392) reports an unusual case observed in a well-nourished girl, aged four years. For five days prior to admission to the hospital she had suffered great pain on passing urine, the act sometimes taking a quarter of an hour because of frequent involuntary stoppages. She had lost appetite and had been listless. Temperature was 100° F., the pulse 120, and respiration 28. The vulva was seen to be unduly red and was very sensitive. The urine was acid, specific gravity 1015, and contained no albumin, pus, nor blood. Pain during micturition was very severe, but did not continue after the act.

Three days later careful exploration of the bladder with the sound and through the rectum yielded only negative results, but it was noticed that two white patches, about one-eighth of an inch in diameter, were present upon the vulva, one on the vestibule, the other on the right nympha; and these had the appearance of diphtheritic membrane, a conclusion that was promptly confirmed by culture. The throat and eyes were negative. Two thousand units of antitoxin were given, and two days later the membrane had disappeared, the redness of the vulva was less marked, and micturition was accomplished with very little pain. The temperature was 98° F., and the pulse 120.

One week later micturition was quite painless and the vulva was perfectly normal in appearance, but the child was still very listless. Nineteen days

after the disappearance of the membrane the temperature rose to 102.8° F., the pulse to 150, and the child vomited. Nasal regurgitation of fluid was now noticed, and persisted, though less markedly, for a week, after which convalescence was uninterrupted.

[The case is interesting not only for the unusual site of the membranous exudate, similar examples of which are occasionally reported, but also for the occurrence of paralytic symptoms in the fauces. According to the usually described progress of diphtheritic paralysis, those parts are first affected which are nearest to the usual seat of the disease (throat or nose), and thence the rest of the muscular system is affected in somewhat regular order. In Dr. Ware's case the fauces seem to have been the only location of paralytic symptoms, the portions of the body nearer to the focus of disease apparently having escaped altogether.—ED.]

Spontaneous Gangrene Consecutive to Pneumonia in a Child.—ZUPPINGER (*Wiener klinische Wochenschrift*, 1899, No. 13, S. 335) reports a case observed in a girl, aged five years, in which the symptoms began, the day after the crisis of a frank pneumonia, with severe pain in the right great toe. Two days later the whole foot became livid, while similar areas appeared on the left foot, the right knee and elbow, and the left shoulder. After a time the lividity faded from the areas on the elbow and the knee, but over the other parts vesicles appeared, followed by gangrene.

Two months later the following lesions were noted: On the back an ulcer of butterfly shape, 10 cm. by 9 cm., covered with healthy granulations. The anterior part of the left foot was completely disorganized, while on the right foot the great toe was gangrenous, with denudation of the head of the first metatarsal bone; the terminal phalanx of the second toe and the second and third phalanges of the third toe were also destroyed. Pulsation was felt in the popliteal artery only upon the left side.

The left foot was removed by a Pirogoff amputation, and upon the right foot the necrosed first metatarsal and the first cuneiform bones were removed. The child made a good recovery.

The author states that this is the first recorded case of post-pneumonic gangrene in a child. In the adult this complication of pneumonia has been reported by Benedikt (gangrene of the foot), by Grimm (gangrene of the fingers), and by Nielsen (gangrene of the fingers and toes).

Chronic Articular Rheumatism in Children.—Three instances of this rare condition in childhood are reported by LACHMANSKI (*Archiv f. Kinderheilkunde*, 1900, Band xxviii., S. 104) in a paper treating of both the acute and the chronic forms of the disease.

The first case was seen in a girl, aged ten years, without hereditary antecedents, the affection beginning as a subacute polyarthritis. For several months there were alternating conditions of improvement and relapse in one or more of the articulations. At the same time there were febrile movements of long duration which accompanied or seemed independent of the articular manifestations. Pain was occasioned by efforts at walking, but was relieved by rest. Despite careful treatment and diet, muscular atrophy, without reaction of degeneration, progressed, and the articular deformity became more

pronounced. All the articulations were involved, even those of the vertebræ and the temporomaxillary joint. Nearly all the joints affected became ankylosed, rendering the patient helpless. No visceral lesions could be detected.

In the second case, a boy, aged eight years, there was chronic articular rheumatism of all the members except the left arm. After a period of slight improvement the symptoms became suddenly aggravated. The child remained under observation for only three weeks. The third observation, of which only a few notes are given, was really a case of arthritis deformans in a girl aged eight years. The disease had begun as a chronic polyarthritis.

THERAPEUTICS.

UNDER THE CHARGE OF

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On the Administration of Anæsthetics to Children.—Mr. W. I. McCURDIE and Dr. C. F. MARSHALL insist that the administration of anæsthetics, especially chloroform, to children is by no means so free from danger as is generally supposed. The muscular system in children is comparatively feeble, so that rigidity is less marked. Elasticity of the chest is at its maximum, so that artificial respiration can be easily and effectively performed. The bloodvessels are more elastic and their contraction tends to counteract any full pressure. The mucous membranes are more sensitive to irritations, particularly of the respiratory tract and the stomach. Cough and mucous secretion are often easily excited, and vomiting tends to occur more rapidly and with less warning than in the case of adults. The nervous system is more sensitive and reacts more quickly to stimulation; hence there is greater tendency to shock, and recovery from it is more rapid. Reflex action is more marked and also more quickly abolished. This results, in the first place, in increased danger from such reflex effects as spasm of the glottis. In the second place, the early abolition of reflex action results in the disappearance of certain guides which are habitually used in the adult, more especially the corneal and conjunctival reflexes, which in children are usually lost some time before anæsthesia is complete. Nervousness and fear are often strongly manifested. The pulse is not quite so reliable a guide in young children as in adults. In preparation for anæsthesia nothing but digestible foods should be given. Milk is forbidden, because curds may be formed under the influence of fear, which may remain undigested for several hours. Whey, or a good meat broth, is recommended. Since children are so liable to shock, they should be kept warm by various devices during the operation. Anæsthesia must be induced with as little crying and struggling as is possible. The dosage of the anæsthetic should be at first continuous and of gradually

increasing strength, while the maintenance of narcosis should be by intermittent doses. As a routine anæsthetic, either the alcohol-chloroform-ether mixture, or a mixture of two parts of ether to one of chloroform, is recommended. For shorter operations nitrous oxide alone, or with oxygen, possesses advantages. Nitrous oxide, however, should not be followed by chloroform. Of the difficulties met with during operation, reflex spasm of the glottis is frequent. When this occurs it is best to push the administration of ether; pushing chloroform is dangerous, owing to the liability to inhale an overdose when the spasm has passed off. If the breathing becomes shallow it may be improved by gently rubbing the lips. If it still fails after removal of any obstruction, artificial respiration must be performed and strychnine and atropine injected subcutaneously. Injections of strychnine and atropine or digitalis are to be used to relieve heart-failure. If this occurs during the commencement of administration and after struggling, it is due to engorgement of the right heart, and should be treated by raising the patient to the vertical position, in order to relieve the overdistended right heart by gravity. If it occurs at a later period it is due to vasomotor paralysis or to the toxic effect of the anæsthetic or the medullary nerve-centres. The treatment for this condition is either partial or complete inversion of the patient, together with artificial respiration. Vomiting after administration may be relieved by sipping hot water or by inhaling vinegar from a handkerchief.—*Treatment*, 1900, No. 2, p. 65.

[If digitalis is to be of any use in heart-failure during surgical operations it should be administered at least thirty-six hours before the operation takes place. For it the quickly acting sparteine or strophanthus should be substituted.—R. W. W.]

Adonidin.—DR. HEINRICH STERN states that this remedy, notwithstanding its most prompt and energetic action, may be safely administered in pathological conditions where digitalis, if given at all, should be administered only with the utmost caution. This refers to fatty degeneration of the heart, pericarditis, simple hypertrophy, compensatory hypertrophy, and certain atheromatous conditions. In rapidity of action adonidin almost equals nitroglycerin. In this respect it surpasses by far other heart remedies, as digitalis, digitalin, digitoxin, caffeine, sparteine, strophanthus, convallaria, and convollamarin. In certainty of action it equals nitroglycerin and surpasses by far caffeine, sparteine, convollamarin, strophanthus, and digitalis or its glucosides. In permanency of action, although no cumulative effects were ever noted, it surpasses nitroglycerin, caffeine, convollamarin, sparteine, digitalis, digitalin, and digitoxin. Its diuretic action in health is limited. As a physiological diuretic it is decidedly inferior to caffeine, strophanthus, convollamarin, and sparteine. In certain affections of the kidney and in pyretic conditions its diuretic action is more pronounced, which is probably due to increased arterial tension. Its greatest diuretic effect is exhibited in conditions accompanied by dropsy and low arterial tension. In the healthy individual it causes a slight increase of temperature, but it tends to lower the body-heat in pyretic conditions. The dose varies from one-thirtieth to one-tenth of a grain two or three times a day. One-sixth of a grain administered in any form influences the œdematous condition and produces diu-

resis, especially when the arterial tension is low.—*Merck's Archives*, 1900, No. 5, p. 163.

[If the irritant properties of this remedy can be eliminated it would meet certain indications more satisfactorily than others of this class.—R. W. W.]

Treatment of Pertussis.—Dr. H. R. NORTON states that rectal injections of carbon dioxide gas given thrice daily, and for from five to ten minutes, had apparently benefited 143 of 150 patients. In instances of severe disease the vomiting had diminished or ceased by the second or third day. The duration of the disease had not been influenced. During the administration of the gas the entire cutaneous surface would flush, especially the face. In a few instances a mild diarrhoea had been set up, apparently as the result of irritation of the rectum by the injection tube. In the following year twenty patients had been treated with a negative result in all; at this time the gas had been taken from the tanks in which it had been compressed.

Various Therapeutic Serums.—Dr. ANTONIO FANONI sums up the present state of our knowledge concerning their value. The efficiency of Pane's serum in lobar pneumonia has been recognized by impartial observers. When injected early enough in sufficient quantity, and if not deteriorated by age, it quickly produces a lowering of the temperature, an improvement in the subjective comfort of the patient, as well as an amelioration of all the other symptoms. Resolution also tends to take place more quickly. Marmorek's antistreptococcus serum has the disadvantage of saving the animals experimented upon only from the streptococcus which was used to prepare the serum, and not from the other varieties of streptococci. It has, however, a certain effect on animals infected with other streptococci, enough to retard death when compared with the control animals. The Yersin-Roux serum against the bubonic plague is very active, judging from experiments on animals; but in man the results are not very satisfactory. The same may be said of the serum of Lustig. About the serum against yellow fever, nothing definite can be said. Maragliano's serum against tuberculosis when put to the test in treating tuberculous patients has given indisputable recoveries. Some of the patients after this treatment finally become immune against doses of tuberculin that are ten times larger than the initial dose which was sufficient to produce a reaction. Tizzoni's antitetanic serum gives results which are very satisfactory. Inasmuch as in diphtheria and tetanus the death of the patient is brought about by the action of the toxins produced by the respective bacteria, the action of these serums indisputably takes place against their respective toxins by counteracting the intoxication of the organism. On the other hand, in puerperal fever due to streptococci, in lobar pneumonia caused by the pneumococcus of Fraenkel, and in bubonic plague produced by the bacillus of Yersin, the toxic phenomena are of secondary importance, while the predominant manifestations are the infectious phenomena—that is, those produced by the bacteria in their immediate contact with the cells of the organism. It is evident that the products of the metabolism of these bacteria, even without the formation of toxins, would be enough to produce such changes in the single cells as to destroy life. The failure of Pane's serum when employed in the pre-agonal stage is explicable

on the ground that we cannot restore the functions of the cells, which are indispensable to the life of the entire organism, once they are destroyed.—*Pediatrics*, 1900, No. 10, p. 393.

Therapy of Kola.—DR. C. C. TARBROUGH believes that this drug is a general tonic stimulant, acting primarily on the cerebro-spinal centres. No depressing effects follow as the influence of the drug wears off. Thus there is absolutely no danger of forming a kola habit, no such result being on record. Its physiological action is analogous to caffeine; but in the fresh state it differs in that it is more pronounced and prolonged. Fresh, undried kola apparently is more active because the caffeine is presented to the system dissolved in the natural juices of the drug, and is readily liberated in a highly active condition. Failure to obtain good results from the drug are very often ascribable to preparations representing the dried drug. Pertussis is much benefited by kola; the attack is cut short and the general condition rapidly improved. Very many patients with asthma experience immediate and sometimes permanent relief. This applies especially to asthma of nervous origin. That due to pressure (tumor) is unaffected by the drug. Kola is a decided diuretic, acting more fully on some people than on others. It is more prompt and efficacious than digitalis and caffeine in combination. It affects the kidney directly, but, in addition, by raising the blood-pressure. As a cardiac tonic it ranks with digitalis; it has, however, no cumulative action, and it is therefore a good substitute for digitalis, or they can be used in combination. Melancholia has been very satisfactorily treated with kola, in some instances complete cure being obtained. In chronic alcoholism and morphinism, kola is invaluable as a stimulant and to support the system against the shock of gradual or sudden withdrawal of the accustomed stimulant. Surgical shock can be combated and even prevented by kola given immediately before and after operation. Collapse is much less likely to ensue. Uterine inertia due to nervous exhaustion responds to the stimulus of kola. Normal perspiration is aided also. The characteristic action of the drug is its sustaining, strength-conserving power, and it is particularly of value when fatigue and exhaustion are imminent, as in loss of sleep.—*Virginia Medical Semi-Monthly*, 1899, vol. iv. p. 429.

[The caffeine-percentage increases in kola on drying, therefore, the preference for the fresh drug is hardly warranted.—R. W. W.]

The Therapeutic Value of Intravenous Injections of Iron.—DOTT F. APORTI has found, after exhaustive research, that the excellent results obtained are due to the remedy and not to other treatment. Within a few days it is possible to increase the hæmoglobin fifty per cent. This is an excellent method, devoid of danger and certain in its results.—*Gazetta degli Ospedali e delle Cliniche*, 1899, No. 181, p. 1386.

Artificial Inoculations.—DR. DYCE DUCKWORTH reports that after two injections of the serum (ten days intervening) there was noticed severe constitutional and temporary local disturbance, general malaise, headache, diaphoresis, with locally a "bruised feeling," an appearance resembling cellulitis, and a very slight febrile movement. One week after the second

inoculation Widal's test was made, and a very sharp reaction followed, even with a dilution of one to two hundred. A like procedure in a second patient gave the same results. The second inoculation, after an interval of some days, is strongly advised to secure the full benefit of the vaccine. Perfect asepsis is, of course, requisite. The patient is to remain in bed two days, keeping quiet until all reaction has ceased. Following these precautions in healthy subjects, results are satisfactory. Widal's test should be tried every six months for some time.—*The British Medical Journal*, 1899, No. 2029, p. 1407.

Diphtheria.—DR H. B. SHEFFIELD notes the local nature of the disease primarily, and that constitutional effects follow through the rapid absorption of the toxins locally formed. A fatal result is due either to septic poisoning or to obstruction of the air-passages. From this the following deductions are made: 1. Endeavor to reduce hyperæmia and excessive exudation in the throat in order to avoid respiratory obstruction. 2. Destroy so soon as possible the diphtheria bacilli, locally, to prevent formation and absorption of toxins. 3. Administer such remedies as will combat or neutralize the toxins, preventing their general dissemination. 4. Promote the action of emunctories in general. Among the germicides this prescription is highly recommended: R.—Glycerite of papoid, 30; carbolic acid, 1; powdered camphor dissolved in alcohol, 1; glycerin to 120. This is to be applied to the throat with a cotton swab every two hours, changing the swab each time, and diminishing the frequency of applications with the abatement of the severity of the symptoms. A second formula is: equal parts of hydrogen peroxide, sodium borate and glycerin dissolved in eight parts of rose-water, of which a tablespoonful is instilled into the nose every two hours, when membranes are present in the nares, and every four hours in their absence. Do not wait until cardiac debility appears before giving stimulants. The complete anorexia so often present is explained as a probable "provision of nature to starve the micro-organisms lodged in the alimentary canal." Nourishing food is, however, insisted on, and nutrient enemata if required. For internal medication strychnine with iron should be given. Antipyretics are rarely needed, and small doses are sufficient to relieve the pain and reduce the fever. Laryngeal diphtheria is not, as a rule, amenable to local treatment. If there be any membrane visible in the fauces the first of the above prescriptions is advised. The nose is always to be cleansed with the second solution. In severe cases intubation is early required, thus dispensing with late tracheotomy. Intubation demands the avoidance of liquids by mouth; strychnine is given hypodermatically. To reduce the swelling of the submaxillary glands, iodine ointment, with ichthyol 10 per cent., is valuable. The writer's experience with antitoxin is that it should be regularly administered in laryngeal diphtheria, though what proportion of the beneficial results obtained from it in connection with local and internal remedies is still undetermined.—*New York Medical Journal*, 1899, No. 1100, p. 954

Deaths Under Chloroform.—DR. J. EDMUNDS makes a further plea for a more accurate administration of chloroform for anæsthesia, insisting that a volumetric measure of the amount inhaled should be made, and that such measure is possible with the Krohne inhaler. He cites eighty-three deaths in

England during 1899, and asserts that if these are reported two hundred must have occurred, the remainder being suppressed. Deaths from chloroform, cyanosis being present, are due to asphyxia; more or less pure air surcharged with chloroform causes spasm of the glottis, of the respiratory muscles, diaphragm, and myocardium. Patients die from asphyxia complicated by angina of the heart. If sudden death do not follow, and chloroform is continued, paralytic relaxation of the glottis follows. The glottis being paralyzed, more surcharged air enters the bronchi, and shortly the end organs of the whole system of respiratory nerves are poisoned by direct soaking. It is not so much the quantity ingested as the local surcharge with chloroform of the lungs and heart. Waller shows that 6 per cent. vapor-volume of chloroform kills a nerve. Four minims of chloroform are the equivalent of four cubic inches of chloroform vapor. This amount would saturate the entire mass of the pulmocardiac blood and myocardium. Eighteen minims of chloroform are required in the blood to induce full surgical anæsthesia. With the Krohne inhaler twenty minims are ingested in one minute. Some will be exhaled by the lungs and skin, but the ingested chloroform is probably a lethal dose by reason of the want of time for diffusion through the general system and the local surcharging of pulmocardiac blood. Therefore a much smaller ingestion of chloroform is advised, the time required for full anæsthesia being about six minutes. Perfectly safe administration can be obtained by beginning with small volumes of chloroform air for each inspiration, such as cause neither cough nor spasm. The feather indicator is recommended as an index for respiratory currents.—*The Lancet*, 1900, No. 3987, p. 227.

The Non-surgical Use of Schleich's Infiltration Anæsthesia.—DR. RICHARD BLOCH proposes this method: 1. For the painless application of the canter. 2. As an anti-neuralgic in (a) peripheral neuralgias; (b) various painful peripheral affections, as bruises, and (c) various joint diseases. 3. In differential diagnosis between (a) neuralgias of peripheral, central, or reflex origin, and (b) simulated and real pains.—*Centralblatt für die gesammte Therapie*, 1900, Heft 2, S. 76.

The Present Aspect of Antitoxic Treatment of Diphtheria.—DR. F. VILLY recommends that the treatment be commenced as early as possible. Ten thousand units will often accomplish more given early than fifty thousand given after several days' duration of the disease. The former dose suffices for mild injections. Twenty thousand units in all are often injected. There is no evidence that such doses produce any harmful effect. A good rule is that antitoxin should be given in sufficient dose to cause a distinct reaction in twelve hours. If reaction does not follow, the dose is to be repeated once or twice until there is some apparent effect. Too much rather than too little is advised. Except in the worst infections results of injection are permanent, complete recovery being likely, though some form of paralysis may follow; anæmia and cardiac weakness persist often for months. Since antitoxin has been used suppression of urine is almost unknown. The increase in albuminuria is largely apparent rather than real, for greater care has been exercised in estimating its percentage. It is un-

common for a permanent nephritis to supervene. The albumin rapidly disappears, and no bad effects follow. Increase in the frequency of post-diphtheritic paralysis is explained by the fact that patients recover from more serious attacks of the disease than formerly, and these are the ones most subject to paralysis. Mild injections may be followed by paralysis, but it is less frequent. Statistics show that the bulk of patients suffering from paralysis are those who undergo antitoxic treatment comparatively late in the disease. Before the introduction of antitoxin this was not the case. Exceptionally, grave constitutional effects follow. They are transient, lasting but a few hours. A chill may occur with fever, and an urticarial rash appears within a short time after injection. Such phenomena occur more frequently in relapses of diphtheria, when a second injection is given several weeks after the subsidence of a primary attack. Antitoxin rashes more often occur between the tenth and fourteenth days. The eruption consists of raised circular erythematous areas, circinate forms often appearing. They are usually confined to the extensor surfaces of the knees and elbows. The eruption lasts from a few hours to several days. Occasionally it resembles measles. The diagnosis is often difficult. Desquamation sometimes follows the eruption. Pyrexia is less common; it is mild and lasts but a few hours. Joint pains are still more rare; they last a few days, and disappear without treatment. Various degrees of heat render blood serum harmless with regard to the above after-symptoms. Antitoxic serum has not as yet been prepared free from these deleterious qualities. Abscesses should never occur at the seat of injection, antiseptic precautions being observed.—*The Medical Chronicle*, 1900, vol. ii. p. 241.

GYNECOLOGY.

UNDER THE CHARGE OF

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Extirpation of the Vagina for Carcinoma.—SIPPEL (*Centralblatt für Gynäkologie*, 1900, No 4) describes the following operation which he performed successfully in a case in which the entire vagina was transformed into a narrow rigid tube through cancerous infiltration of its walls. An incision was made on the left side of the introitus between the anus and tuber ischii, the ischio-rectal fossa being freely opened. The left lateral and posterior vaginal walls were separated by blunt dissection as high as the attachment of the levator ani, bleeding vessels being ligated. The incision was then carried around the introitus and the urethra separated. The lower end of the vagina was then clamped and drawn downward, while the rectum and urethra were protected by retractors, which separated the upper and lower edges of the wound so that the relations of the organs in the pelvis could be

easily studied, and the bladder and ureters pushed upward. The bases of the broad ligaments, with the uterine arteries, were ligated and divided; then the posterior fold of peritoneum was opened, the uterus returned, and finally the uretero-vesical fold was incised and the upper portions of the broad ligaments were ligated. The adnexa, being normal, were not disturbed. The uterus and vagina having been removed *en masse*, the stumps were brought down and sutured in the angles of the wound near the introitus, so that the lateral raw surfaces were covered with peritoneum. The anterior and posterior peritoneal edges were also attached to the introitus, and the external wound was sutured, a small opening being left, which was packed with gauze. The operation was completed in an hour, only a moderate amount of blood being lost. Recovery was afebrile. The patient was up at the end of three weeks, the wound having healed entirely, without any disturbance of the bladder or rectum.

The advantages of the procedure are the fact that the field of operation is perfectly visible and accessible, while the vagina and the cancerous tissues are excluded from contact with the wound.

Unusual Case of Elephantiasis Vulvæ.—LAUWERS (*Ibid.*) reports a case of elephantiasis in a woman, aged thirty-five years, in which the tumor had begun to develop twenty-four years before. The growth extended two hand-breadths below the knees, so that locomotion was impossible except when the legs were widely abducted. The patient desired an operation so that she could marry. The pedicle covered the hypogastrium above, and the vulva and anal region below. Flaps were dissected off both sides of the pedicle, and it was divided, the hemorrhage being moderate. The raw surface was thoroughly covered and primary union resulted, except at the upper and lower angles of the wound, where drains had been inserted.

Menstruation, which had been absent for some time, returned normally.

Adenoma Malignum.—SINCLAIR (*Ibid.*) believes that neoplasm develops more slowly than carcinoma. He thinks that it is difficult to distinguish microscopically between benign and malignant adenoma, except that the glands show an irregular arrangement in the latter. Invasion of the subjacent muscular tissue by the glands is the only positive evidence of malignancy.

Adenomyoma of the Epoöphoron and Paroöphoron.—PICK (*Virchow's Archive*, Band clvi., Heft 3), from a study of these growths, arrives at the following conclusions: 1. From the parovarium may develop adenomyomata of the broad ligament which contain cytogenous connective tissue with glands which are identical with those of the primordial kidneys. 2. As the tumors develop and undergo histological changes the differences between those springing from the epoöphoron and paroöphoron become less marked, so that their origin cannot be positively inferred. 3. Adenomyomata, the epithelial elements of which are derived from the primordial kidneys, if they are found in the uterus, tubes, posterior vaginal fornix, or iliac region, are of parovarian origin, while those in the broad ligaments spread from the epoöphoron. 4. The glandular portions of these growths closely resemble

the uterine mucosa, and when found in the epoöphoron may simulate an accessory uterus.

Inversion of the Uterus by Tumors.—ALEXANDER (*Archiv für Gynäkologie*, Band lviii., Heft 2) distinguishes partial inversion from beginning inversion. While the size and weight of the neoplasm and the influence of the intra-abdominal pressure in a patient with relaxed abdominal walls are important factors in causing inversion, uterine contractions must be regarded as the principal cause.

Influence of Other Diseases on Cancer.—WILLIAMS (*Edinburgh Medical Journal*, 1898, No. 10), as the result of a series of several hundred observations on living and dead subjects, arrives at the conclusion that erysipelas inflammation has no retarding influence upon the development of cancer. The apparent arrest of malignant disease is due rather to the poor vitality of the patient. Syphilis is relatively a rare accompaniment of cancer, also tuberculosis in the active stage. On the other hand, the writer found at autopsies old or arrested phthisical foci three times as often in cancerous as in other subjects, so that malignant disease seemed to exercise a retarding influence on pulmonary tuberculosis.

Dilatation of the Anus in Inoperable Carcinoma.—PONCET (*Lyon Méd.*, February 19, 1899) calls attention to the favorable action of dilatation of the anal sphincter for the relief of the neuralgic pains accompanying inoperable carcinoma of the uterus and prostate. Under anæsthesia both the anus and rectum were thoroughly dilated with the finger or with specula, the relief being quite marked and persisting for some time. The operation can be repeated at intervals, since it is quite harmless.

Papillary Tumors of the Fallopian Tube.—MAIREZ (*Inaugural Diss ; Centralblatt für Gynäkologie*, 1900, No. 6) has collected reports of thirty-three cases, twenty-four being malignant, nine benign growths. They develop in cysts which form in the tube without any change in its walls. The benign form presents the ordinary type of an adenopapilloma, the malignant that of epithelioma; the latter may be primarily cancerous or develop from a pre-existing papilloma. Papilloma of the tube follows salpingitis. The epithelial cells on the walls of the cysts undergo hyaline degeneration, and the serum fluid which results may escape into the peritoneal cavity, causing general or encysted ascites, or it may make its way into the uterus through the proximal end of the tube, leading to intermittent vaginal discharges. It is not possible to make a certain diagnosis of this condition before opening the abdomen.

Changes in the Adnexa in Cases of Uterine Fibroid.—GRECO (*Annales de Gyn. et d'Obstetrique*, 1900, No. 1) finds that the principal changes in the tube consist in hypertrophy of the mucous membrane and muscular tissue, often associated with catarrhal inflammation, rarely suppuration. Atresia of the uterine end of the tube is sometimes observed.

The ovary is usually hypertrophied and contains small cysts, sometimes

small purulent foci. Microscopically an increase in the size and number of the vessels is noted, with proliferation of the connective tissue of the stroma. The Graafian vesicles disappear, and microcystic degeneration and formation of corpora fibrosa result.

Danger of Coitus in Inflammatory Conditions of the Uterus and Adnexa—BELIN (*Rev. Prat. d'Obstetrique et de Gynécologie*, 1899, No. 12) reports a case of pyosalpinx which ruptured in consequence of violent coitus, leading to infection of the peritoneum, the patient being saved only by an early section. He believes that these cases are not rare, and insists that intercourse should be absolutely interdicted in the presence of inflammation of the uterus and adnexa.

Predictions Regarding Conceptions.—CERF (*Ibid*) reports the case of a woman, aged fifty-three years, who had not menstruated for four years, who desired a certificate from a physician to present before a court of law that it was impossible for her to become pregnant. After a careful review of the literature of the subject, and receiving the opinions of several experts, the writer arrived at the following conclusions: 1. There is no positive sign of the menopause. 2. The menopause does not coincide exactly with the cessation of ovulation. 3. There is no certain criterion of inaptitude for conception.

Castration in Uterine Fibroids.—SCHÜLEIN (*Berliner klin. Wochenschrift*, 1899, No. 38) argues in favor of removal of the adnexa in cases of fibromyoma of the uterus, his results as regards both the cessation of hemorrhage and the disappearance of the tumor having been most satisfactory. The possibility of subsequent malignant degeneration of these growths he believes to be so rare that it may be disregarded. He mentions the following indications for the operation: 1. Interstitial tumors, which do not exceed in size the pregnant uterus at seven months. 2. Smaller growths in a patient who is so weak that a radical operation is not advisable.

Histogenesis of Uterine Fibromyomata.—RIZZUTI (*L'Indépendance Médicale*, September 20, 1899), as the result of his histological studies, believes that fibromyomata of the uterus developed from the small branches of the uterine and ovarian arteries in consequence of local irritation—in short, that they represent simply a partial hyperplasia of the uterine tissues.

Senile Endometritis.—LORAIN (*Revue méd.; Frauenarzt*, January 19, 1900) calls attention to the importance of making an exact diagnosis in this condition, since hemorrhage is a frequent symptom. The treatment consists in dilatation of the cervical canal and the application of carbolic acid, iodine, or ichthyol two or three times weekly, followed by the insertion of a strip of gauze. This will usually be successful in three or four weeks.

Painful Endometritis.—SNEGUIREFF (*Archiv für Gynäkologie*, Band lix., Heft 2), in a paper on this subject, summarizes as follows: 1. Patients with

this condition are apt to complain of general nervous symptoms rather than local, hence they are often regarded as purely neurotic. 2. This error is also due to superficial examinations and the failure to test the sensitiveness of the endometrium, the uterus being regarded as normal because it is not enlarged. 3. There is an intimate relation between the sympathetic nerves of the pelvis and the lumbar plexus, as shown by the pains on the inner aspect of the thighs in connection with painful endometritis.

Treatment of Pelvic Peritonitis.—STRATZ (*Zeitschrift für Geb. u. Gyn.*, Band xlii., Heft 1) concludes a paper on this subject as follows: Nearly all infectious diseases of the adnexa are curable, at least symptomatically, by conservative treatment, without operation. The prognosis is best in puerperal cases. In a small proportion of old gonorrhœal and tubercular cases only is operation justifiable. The writer calls attention to the fact that death rarely results from inflammation of the adnexa. In 1000 cases he has operated only twenty times. He believes that, in spite of the diminished mortality, the general disposition to remove diseased adnexa is to be reprehended.

Castration in Rudimentary Uterus.—EBERLIN (*Ibid.*) reports a case in which the operation was performed on account of severe attacks of abdominal pain. The patient, a married woman, had never menstruated, and intercourse was impossible on account of an undeveloped vagina. The uterus was absent, but the ovaries could be palpated. The latter were removed and the menstrual molimina ceased entirely. The writer has collected twenty-one cases in which the operation was performed, all but two being successful. One patient died of septic peritonitis, and the other continued to suffer from general nervous disturbances.

Appendicitis and Disease of the Adnexa.—In a discussion before the Leipzig Obstetrical Society, FIRTH (*Monatsschrift für Geb. u. Gyn.*, Band ix., Heft 2) called attention to the fact that the appendicular ovarian ligament described by Clado, instead of being constant, is the exception. He believed that the frequent occurrence of appendicitis as a complication of disease of the right tube and ovary was due simply to the tendency of the appendix to descend into the pelvis and to become adherent to the tube. In most of these cases such changes will be found to have occurred in the walls of the appendix that its removal is indicated.

SAENGER thought that it was important to inspect the appendix in all cases of inflammatory disease of the adnexa. The former might contain a pus-focus even when there were no evidences of peri-appendicitis.

ZWEIFEL raised the question whether purulent salpingitis could arise from the migration of colon-bacteria or streptococci from an adherent suppurating appendix, without actual rupture of the abscess into the tube, because it had been proved that these micro-organisms did not cause suppuration when brought in contact with the healthy tubal mucosa.

KRÖNIG thought that when appendicitis and pyosalpinx coexisted it was exceedingly difficult to discover the origin of the process.

OBSTETRICS.

UNDER THE CHARGE OF

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Malaria and Pregnancy.—In the *British Medical Journal*, 1899, No. 2000, EDMONDS contributes a paper upon the influence which malarial intoxication has upon pregnancy.

He considers it a serious matter, as foetal life is often sacrificed and the mother is sometimes in danger. We distinguish intermittent, remittent, and cachectic malarial states as affecting the period from conception to the sixth month, and from the sixth month to the end of the puerperal period. The simple intermittent has no effect upon conception, and if mild, none upon the mother's or the child's life. As an illustration of this he cites the case of a young girl who had had a slight intermittent malaria for six months, and who, during this time, became pregnant. If, however, the intermittent is acute, and the temperature rises above 104° , abortion usually takes place. In cases of pregnancy complicated by acute intermittent malaria the uterus is hard and firmly contracted, but if quinine be given promptly and the temperature does not rise above 104° , the mother and child may be saved.

The bilious remittent malarial fever has the same effect on pregnancy which the simple has, but differs in degree, the fever being higher, abortion more common, and hemorrhage being pronounced. Here, again, if the case be taken early, treatment may be successful. He describes the case of a young girl who had had fever for nine months, and who was very cachectic. Under appropriate remedies she recovered and became in very good condition.

During the second period of pregnancy the complication of malaria gives rise to much more acute and dangerous conditions. The foetal movements become strong and cause severe pain, uterine cramp is severe, and very often a dead child is expelled, its epidermis peeling and appearing mottled, and the placenta of a heavy, dull color.

When bilious malarial fever complicates, the second period of pregnancy grave danger arises. The reaction of the foetus at first is marked, but becomes weaker and fades away. The contraction of the uterus is not so firm, but is painful, and there is much soreness and tenderness over the abdomen. The patient aborts or miscarries, but often fails to expel the child and its appendages completely. There may be severe hemorrhage after expulsion of the child, with progressive weakness, black stools, and death from exhaustion within ten days after labor. The child may be strong and healthy.

When a pregnant patient has the cachexia of malaria the pregnancy is influenced very much as in any other cachectic condition. The stomach refuses to

take nourishment, labor is slow and lingering, and operative interference is often imperative. The child may not be affected.

The writer considers malarial fever responsible for a large number of stillbirths. During the hot stage the uterus contracts strongly, and the foetus is subjected to great pressure. This usually causes its death, and the dead child is expelled a few hours after the active stage. No hesitation need be felt in giving quinine in large doses to prevent this accident. Pregnant patients during the early months often take 10 and 15-grain doses of quinine without interrupting the pregnancy.

Tubal Pains.—In the *Centralblatt für Gynäkologie*, 1899, No. 19, THORN calls attention to the intense suffering which some patients experience in tubal gestation. These cramps are so severe as greatly to exceed the most trying pains of ordinary labor. Thorn had a case in which this symptom of cramp was very prominent, and upon which he operated. He found tubal pregnancy in process of abortion. The ovum was partly expelled from the tube and the tube was partly inverted and constricted.

Thorn's case well describes the probable cause for these very severe cramps.

The Treatment of Cancer of the Cervix in Pregnant Patients.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, Band ix., Heft 1, 1899, MERRENS discusses this subject, reviewing its literature, and adding an interesting case of his own.

His patient was forty-five years old, had been previously healthy, and had borne nine children. During the present pregnancy she was well until a sudden hemorrhage occurred. This ceased when she resumed a recumbent posture.

On examination, the patient was about thirty-six weeks advanced, and upon the posterior lip of the uterus was a nodule of cancer about the size of a hen's egg. The cervix was infiltrated through a considerable part of its extent, but the surrounding tissue seemed to be free.

As the patient was so near term, the child being wholly viable, labor was induced. The child and appendages were easily delivered spontaneously. Eight days after the birth of the infant the uterus was removed by vaginal hysterectomy. The patient made an uninterrupted recovery.

[The removal of the cancerous uterus during pregnancy is best accomplished by vaginal hysterectomy at the two extremes of pregnancy: during the early months, when the tumor is sufficiently small to be removed without difficulty, and near the end of pregnancy, when the child has been removed, and the recently emptied womb may also be delivered through the vagina. Before the child is viable and after the first months of pregnancy, the majority of operators prefer to open the abdomen and to remove the entire uterus unopened. Infection seems to be best avoided by this method, and the results have been good.]

The Induction of Labor.—HEYMANN, assistant in Mermann's clinic at Mannheim, contributes a very interesting paper upon the methods and indications for the induction of labor. He bases his conclusions upon 107 cases,

and has subjected these cases to careful analysis and study. While his paper must be read to be appreciated fully, his conclusions are available and are worthy of note.

The objection is often urged against the induction of labor that it has a considerable mortality both for the mother and child. So far as the analyses of his cases are concerned, he has found no mortality following the induction of labor from any cause which is not in some cases operative in normal labor. He feels justified in concluding that the induction of labor by the introduction of aseptic bougies has in itself for the mother no mortality directly resulting from this procedure. He believes that the use of bougies is the best method in all cases; that it is uniformly successful, provided the physician realizes that induced labor is a gradual process. It must not be expected that birth will proceed as rapidly as in many normal cases, and if this fact be taken into account the method is entirely satisfactory. Its simplicity is its chief merit, and from this results its harmlessness.

In disproportion between the child and the mother, the best time for the induction of labor is from the thirty-third to the thirty-fifth week, when its results are better than those of any other method of delivery for both mother and child. Among children so born 64.3 per cent. survived in good condition. Cæsarean section gives a better result for the children, but at a much greater risk to the mother.

In comparing Cæsarean section with induced labor, it must be remembered that the brilliant results of the former are obtained by skilled operators in good hospitals, while the induction of labor is possible to persons of average skill and without hospital advantages.

Care must be taken that the induction of labor be not practised when the pelvis is too small. An internal conjugate of 7 cm. (two and three-quarter inches) is the lowest measurement at which the induction of labor can be expected to be successful.

Before the thirty-fifth week of gestation the chance of survival for the child is not good, while after the thirty-fifth week, if the child has good care, its chance is as good as at full term.

The induction of labor gives brilliant results in cases in which the pregnant woman is attacked by some disease which threatens to end her life. Its field may be extended also to those conditions which cause the mother during pregnancy great suffering, and render the continuance of the pregnancy a serious matter—for example, when the mother's respiration is greatly interfered with by polyhydramnios and the presence of twins, and when severe abdominal pains occur. These latter cases often result from endometritis. In these cases complicated by hemorrhage the induction of labor is also indicated. In fevers occurring during pregnancy it may be necessary to end the pregnancy, and thus remove a serious complication. In retroversion and retroflexed uteri which cannot be replaced, in molar pregnancy, and in pernicious nausea and vomiting, the induction of labor is often of the greatest value.

Under favorable conditions eclampsia during pregnancy should be treated by the induction of labor, but the cases must be carefully selected.

The writer lays especial stress upon the positive indication for induced labor found in nephritis, valvular heart lesions, and tubercular infection. In

the presence of these conditions pregnancy in his opinion should be terminated. He would interfere early rather than late in these cases.

While fully recognizing the value of Cæsarean section and symphysiotomy, under favorable conditions he believes that induced labor has a valuable field, the limits of which by our accumulated experience can now be well defined.

DERMATOLOGY.

UNDER THE CHARGE OF

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Interdigital Hyperkeratotic Eczema. —DUBREUILH (*Annales de Dermatologie et de Syphiligraphie*, 1899, No. 12), under the above title, reports four cases of an affection hitherto undescribed. The parts affected were almost exclusively the spaces between the toes; in only a single instance were similar lesions found between the fingers. The surfaces of the toes in contact were covered with a shining, white, almost blue, thick corneous layer, which came away in strips, first loosening at the edges while firmly attached in the centre. Beneath this corneous layer the skin was a deep red. This desquamation was incessantly reproduced, and was not accompanied by much pain or itching. There were occasionally subacute attacks of vesicular eczema upon the dorsal surface of the toes. Hyperkeratosis was a frequent accompaniment of the disease. Treatment was unsatisfactory, but an alcoholic solution of ichthyol produced decided improvement.

Treatment of Ulcers of the Leg by the Products of the Bacillus Pyocyaneus. —BUKOVSKY (*Annales de Dermatologie et de Syphiligraphie*, 1899, No. 12), who treated one hundred cases of ulcer of the leg with the products of the bacillus pyocyaneus, obtained a definite cure in a short time without having had to employ any auxiliary remedies, even in cases which had proved rebellious to other forms of treatment. Compresses impregnated with the toxin were applied to the ulcers and were renewed two or three times a day. The toxin had no effect upon the patient's general condition and produced no subjective local symptoms; nor was the neighboring epidermis, whether normal or pathological, affected. It had no unfavorable effect upon the granulations. Its action upon the ulcer was manifested by rapid cleansing when there were no complications; if eczema, varices, cicatrices, or elephantiasis were present this took place a little more slowly. It favorably affected epidermization, and produced solid cicatrization more rapidly than any other topical application.

Lupus Erythematosus and Tuberculosis.—ROTH (*Archiv für Dermatologie und Syphilis*, Band li., Heft 1), after a careful study of many published cases of lupus erythematosus, concludes that this affection must be regarded as of undoubtedly tuberculous origin, being produced by the toxins of tuberculosis, which, perhaps, have been modified by unknown biological factors or have undergone some attenuation. The acceptance, however, of certain predisposing, partly local, partly general, conditions of the body of the patient is necessary for the explanation of the process.

Imperfect or Deficient Urinary Excretion as Observed in Connection with Certain Diseases of the Skin.—BULKLEY (*Journal of Cutaneous and Genito-urinary Diseases*, March, 1900) presents a study of 2000 analyses of the urine of patients suffering from various diseases of the skin. In 316 cases of eczema there were very few specimens of urine which did not show gross and radical departures from the normal. In acne the analyses showed abundant evidence of disturbed assimilation. In psoriasis the acidity was high, and oxalate of lime was frequently seen. The urea was a little above the normal. Upon the whole, however, the results of the analyses were somewhat disappointing as to positive facts connected with the condition of the urine in diseases of the skin.

The Histogenesis of Melanosarcoma of the Skin.—SCHALEK (*Journal of Cutaneous and Genito-urinary Diseases*, April, 1900), having studied five cases of melanosarcoma, concludes as follows concerning the origin of this neoplasm: Melanosarcoma of the skin arises from pigmented cells of the epidermis, these cells proliferating into the connective tissue and becoming entirely detached from the epidermis. Continuing to proliferate, these cells lose their epithelial character and assume that of ordinary connective tissue cells and that of those pigmented cells known as chromatophores. The author believes the view held by Unna and his followers is probably correct.

Tobacco Soap as a Parasiticide.—MARCUSE (*Therap. Monatsheft.*, 1899, No. 12) has found soap containing tobacco a useful remedy in a number of parasitic and other affections of the skin. He has successfully treated 32 cases of scabies, 6 cases of tinea versicolor, 4 cases of tinea tonsurans, and a few cases of urticaria and prurigo with such soap. The method is to be recommended on account of its cleanliness and cheapness.

Meningitic Herpes.—EVANS (*British Journal of Dermatology*, March, 1900) calls attention to the fact that a considerable number of cases of herpetic eruption have their starting-point in a meningitis—a fact of importance, both from a diagnostic and prognostic point of view. Herpes zoster may occur in epidemic cerebro-spinal meningitis, being one of the more common cutaneous manifestations observed in this disease. Herpes may occur in tuberculous meningitis, but it is decidedly rare in this form. It is noticed more frequently in the non-tuberculous basal meningitis of children, being usually bilateral, affecting the branches of the fifth nerve. It occurs in meningitis from extension of disease of the middle ear, usually over some branch of the fifth pair. The characteristics of herpes zoster accompanying

meningitis are as follows: A very great tendency to be bilateral, especially noticeable in epidemic cerebro-spinal meningitis and the non-tuberculous basal form of children; greater persistence than the usual form; and, lastly, correspondence of the eruption with the distribution of the nerve-root and not with the distribution of the nerve, except when these are practically identical, as in the dorsal region of the cord.

The Blood in Xeroderma Pigmentosum.—OKAMURA (*Archiv für Dermatologie und Syphilis*, Band li., Heft 1), who examined the blood in three cases of xeroderma pigmentosum observed in Prof. Kaposi's clinic, found in all three cases an oligocythæmia associated with a tolerably well-marked leucocytosis. In the absence of other discoverable cause, the author believes these changes in the blood are due to the interference with the functions of the skin. This exerts a prejudicial influence upon the entire organism and disturbs the functions of the blood-making organs. In two of the cases the eosinophilous cells were increased; in the third they were diminished.

Formalin in Hyperidrosis Pedum.—ADLER (*Deutsche med. Wochenschr., Therapeut. Beilage*, No. 10) prefers formalin before all other remedies in the treatment of hyperidrosis. Although the treatment has to be repeated from time to time, this is a disadvantage belonging to all remedies. The formalin may be painted on with a brush. When rhagades exist between the toes these should be healed before using the formalin, the author employing tannoform for this purpose.

Eugallol in the Treatment of Psoriasis.—GOLDSCHMIDT (*Dermatologisches Centralblatt*, iii., 1; *Journal of the American Medical Association*, April 7, 1900) has employed eugallol in the treatment of a number of cases of inveterate psoriasis. A solution made with acetone was painted daily for several days upon the affected parts, and was followed in from fifteen to thirty minutes by the application of a zinc paste. The black discoloration which it produces is an objection to its use on the face; but this discoloration only lasts a few days, and may be partially removed by means of ether. Some of the conclusions based upon the results obtained are as follows: Eugallol, used as above described, exerts an extremely rapid and energetic action on psoriatic efflorescence in every stage. In very extensive eruptions this method is too tedious and difficult of application to be employed; but it is excellently adapted for isolated inveterate plaques that are resistant to all other treatment. Toxic effects are never observed, even after the most extended use, or are very unimportant. In some cases it produces slight local irritation, which, however, rapidly disappears when its use is suspended.

Herpes Zoster Due to Arsenic.—BETTMANN (*Archiv für Dermatologie und Syphilis*, Band li., Heft 2) reports the case of a woman, aged fifty years, who, after the administration of arsenic by the mouth and subcutaneously for a malignant lymphoma, developed a gangrenous ophthalmic zoster, a diffuse and generalized vesicular eruption, and palmar and plantar hyperkeratosis. All these cutaneous manifestations, the author believes, were due to the arsenic taken; and the case is reported as affording proof that there actually is an arsenical zoster.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Disinfection by Steam.—Owing to the fact that observations at one of the United States Quarantine Stations had shown that steam introduced into cylinders under pressure, but without continuous outlet, left “dead spaces” of less than 212° F., and penetrated pillows, mattresses, etc., very slowly, DR. H. R. CARTER, U. S. M. H. S. (*Public Health Reports*, April 27, 1900), attempted to remedy the defects by turning on a considerable head of steam and allowing it to escape freely. He found that articles penetrated slowly by still steam were penetrated rapidly by flowing steam. Wads of cotton quilts were the most difficult to penetrate, and feather pillows the next; mattresses and blankets under any condition of roll or wad were penetrated very readily. The preliminary use of a vacuum was found to hasten penetration materially and to offer very considerable advantages when it is desirable to lay fabrics flat or to pack a large amount of clothing in the chamber at one time. When the articles are very closely packed a second and even a third vacuum followed by steam under pressure may be used to insure greater penetration; but, as a rule, close packing results in getting the fabrics out in too wet a condition for immediate removal, so that no time is gained, even though the drying vacuum is employed. When they are loosely packed they dry as well, or nearly so, with flowing steam as when the drying vacuum is used. With plenty of room for a large chamber, and when the articles handled are chiefly seamen’s clothes and bedding, the method with flowing steam is probably the best, since little skill is needed, and each owner unpacks and repacks his baggage; but for passenger work, when room is scarce and the work heavy, the vacuum offers very great advantages, and with care gives far better results.

Elimination of Bacteria Through the Mammary Gland.—The contention of Basenau, that under ordinary conditions the mammary glands are not an exit for bacteria circulating in the blood, but that in severe or long-continued sickness they may throw them out, is supported by the conclusions of BASCH and WELEMSKY (*Archiv für Hygiene*, vol. xxxv., p. 205), who experimented with a number of varieties of bacteria. They found that the milk of guinea-pigs infected with the organisms of typhoid fever, cholera, diphtheria, and anthrax was quite free from them, but that in local affections of the mammary glands *B. pyocyaneus* and *B. bovis morbificans* were found with regularity. With simultaneous infection by *B. bovis morbificans* and *B. anthracis* the latter were also found.

That the milk of a tuberculous mother may be a source of infection for her child is shown by a case recorded by ROGER and GARNIER (*Comptes Rendus de la Société de Biologie*, March 2, 1900, vol. lii.). Four days after her confinement two guinea-pigs were inoculated with her milk; one died of tuberculosis, but the other, which received a smaller dose, showed no ill effects. Seventeen days after delivery the woman died with advanced pulmonary tuberculosis. Her child lost weight from birth and died when six months old. Tubercular lesions of the mesenteric glands, liver, spleen, and kidneys were found, and in them the presence of the specific bacilli was demonstrated.

Preservative Action of Common Salt.—According to A. PETTERSON (*Archiv. für Hygiene*, vol. xxxvii. p. 171) common salt does not exhibit the same degree of inhibitory action with all forms of bacteria, those which attack albumin most vigorously being the most easily affected, and bacilli in general being much more sensitive than cocci. When its proportion in the raw material exceeds 5 per cent. the growth of obligate anaërobes is inhibited, and only aërobes and facultative anaërobes are to be found. The growth of bacilli as a class is inhibited by 10 per cent., but a few species will withstand 12 per cent., and in pure bouillon cultures even 15 per cent. Cocci as a class grow very well in the presence of 15 per cent., and so does a certain yeast observed in preparations of meat and fish. The chief factors in the activity of salt as a preservative are general retardation of growth of organisms and inhibition of those which decompose albumin. When fish are preserved with the smallest amount of salt necessary to prevent putrefactive changes, extensive growth of organisms which do not induce putrefaction is not prevented, and these may bring about desirable changes in appearance, smell, and taste.

A New Method for the Determination of Fat in Milk. A simple and accurate method for determining the percentage of fat in milk is offered by BONNEMA (*Chemiker-Zeitung*, 1899, p. 541). In a cylinder of sufficient capacity 10 c.c. of milk and 1.5 c.c. of a 20 per cent. solution of caustic potash are shaken together, and then 25 c.c. of ether are added and the whole shaken for five minutes, after which the vessels and contents are allowed to stand for a while in cold water. Next are added 2 grammes of gum tragacanth, which on thorough shaking takes up all the water, leaving the supernatant ether in a clear state. Ten c.c. of the ether are evaporated in a weighed dish, and the weight of the residue, which represents the fat of 4 c.c. of milk, is noted. This multiplied by 25 gives the percentage of fat in the sample.

"Smoke Color" for Sausages.—Several samples of a "smoke color" recommended as a perfectly harmless preparation for use in the manufacture of Frankfurt and other forms of sausage have been examined by JUCHENACK and SENDTNER (*Zeitschrift für Untersuchung der Nahrungs und Genussmittel*, 1899, p. 417), who report that they consist of Orange II., the sodium salt of azo- β -naphthol-sulfanilic acid. As much as can be taken up on the point of a knife is dissolved in about 20 litres of water, and the solu-

tion is then used cold or at the boiling-point, according to the kind of sausage. In the proper dilution it imparts a fine reddish-brown color to the casing and makes the sausage appear as if the whole of its substance had been smoked, when such is not the case. Animal experimentation demonstrated the harmlessness of the agent.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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On Areas of Large Cells in the Lymph-nodules of the Spleen in Diphtheria and Other Affections—TATIANA WASCHKEWITSCH notes that (*Virchow's Archiv*, 1900, vol. clix., p. 137) Bizzozero called attention to the occurrence of areas of large epithelioid cells in the lymph-nodules of the spleen, intestine, and mesenteric lymph-nodes in cases of diphtheria as early as 1876, but his observations have been generally overlooked. He described the cells as round, oval, or polyhedral in shape, sometimes as much as 30 mikra in diameter, and as containing each an oval, pale nucleus, in which was a distinct nucleolus. In the protoplasm he found in addition to numerous albuminous granules, two to ten small bodies, a few of the size of the nuclei of lymphoid cells, but many smaller. They are glistening, homogeneous, and stain with carmine; he considered them to be the nuclei and nuclear fragments of lymphoid cells which had been taken up and destroyed by the large cells. In the centres of the areas of cells he found only nuclear detritus. This description gives the essential facts about these areas of large cells: Improved technique has added but little. They have been described more recently by Barbacci and others, and are mentioned briefly in the textbooks of Ziegler and Ribbert.

Waschkewitsch examined the spleen in 200 cases of diphtheria and other diseases, and concludes that Bizzozero described the later stages of the process. The following is a brief summary of the cell changes as described by the writer:

In the early stages the cells have a decidedly epithelioid character; they are large and round or polyhedral; they are more or less spherical, not flattened; they are separated from each other by clefts in which no evidence of cell processes can be found. There is also no sign between the cells of the normal reticulum of the lymph-nodule. The protoplasm of the cells is finely granular or homogeneous; the nucleus is vesicular, stains lightly, is oval in shape, and measures three to five times the diameter of a lymphoid cell. Each nucleus contains a distinct nucleolus. The cells usually contain but one nucleus, rarely two.

The cells frequently contain light yellowish-red pigment granules, which give the iron reaction; evidently the pigment is derived from hæmoglobin.

Between these large epithelioid cells there occur lymphoid cells, and rarely cells with long, narrow, vesicular nuclei, resembling the nuclei of the normal reticulum.

The areas of epithelioid cells described above undergo degenerative changes. The nuclei are most affected; the chromatin granules and the nucleolus collect on the inside of the nuclear membrane, leaving the centre colorless. The nucleus loses its oval shape and becomes folded; it is kidney-shaped or in marked degrees is irregularly jagged; the nuclear membrane is crumpled.

The protoplasm of the cells also shows degenerative changes; vacuoles appear, and the cells may swell so much as to measure 100 mikra in diameter. The most important change is that the cells fuse together, so that they form a coarse network. The writer believes that these large epithelioid cells are leucocytes which have wandered into the lymph-nodules.

The areas of large cells were found in 21 out of 24 cases of diphtheria, and in 11 out of 170 cases of other diseases. They occur chiefly in children, and are supposed to be due to the effect of toxins.

[The writer makes no mention of observing the cell inclusions so often found in great numbers within these epithelioid cells; does not state which one of the leucocytes in the blood he believes to wander into the lymph-nodules to form the areas of large cells; and, finally, does not show that the leucocyte, probably the polynuclear, which he thinks wanders in, is ever phagocytic for other cells.]

The Histology of Acute Lobar Pneumonia.—PRATT (*Welch's Festschrift*, 1900) gives the results of a histological study of fifty cases of acute lobar pneumonia. The tissues were hardened in Zenker's fluid, embedded in paraffin, and the sections stained with eosin, followed by Unna's alkaline methylene-blue solution.

In the early stages of the disease the alveoli contained many cells almost identical in appearance with the so-called "transitional cell" of the blood. They were usually slightly larger than the polynuclear leucocyte, the nucleus was irregular in shape and vesicular, and the protoplasm contained either a few granules or was homogeneous. In a case in which death occurred eleven hours after onset there were many of these cells in the exudate and no polynuclear leucocytes.

The origin of these cells is uncertain, but probably they arise from proliferation of the epithelial cells lining the alveoli, as many mitotic figures were found. They may be transitional cells which have emigrated from the bloodvessels, but no evidence of emigration can be found. Similar cells occurred in the lymphatics and in the pleural exudate.

After the first forty-eight hours the predominating cell in the exudate was the polynuclear leucocyte. It is phagocytic for bacteria, but not for other cells.

Large phagocytic cells were found in the exudation in all stages of the disease, but in greatest number in gray hepatization. They probably are the cells mentioned above as derived from the alveolar epithelium. A

proof of this is the fact that the cells while still attached to the walls of the alveoli are phagocytic. The inclusions in these cells are chiefly polynuclear leucocytes and lymphocytes, more rarely red blood-globules. Similar phagocytic cells occur in the lymphatics, in the pleural exudate, and in the bronchial lymph-nodes. In the pleural cavity they are derived from the lining epithelium; in the lymphatics and lymph-nodes from the endothelium.

The fibrin in the exudation usually is more abundant in the peripheries of the alveoli than in the centres. Strands of fibrin and even bundles of fibrin threads often pass directly through the alveolar wall from one alveolus to another.

Thrombi were noted in one-half the cases; usually only small vessels and capillaries were affected. Fibrinous thrombi predominated. Emboli composed of giant cells from the bone-marrow were found frequently.

The lymphatics were involved late in the disease; there was proliferation of their endothelium, and they became distended with cells, serum, and fibrin.

In cases dying during the second week there was often a great infiltration of the interstitial tissue with lymphoid and plasma cells. As a rule, the longer the duration of the disease the greater the number of plasma cells.

The Transplantation of Ovaries into Male Animals.—SCHULTZ (*Centralbl. f. allg. Path.*, vol. 'xi., p. 200) experimented upon guinea-pigs. The ovaries were transplanted upon the peritoneal wall in males. Ovaries were also transplanted upon the castrated female and upon normal females in the same manner. He finds that the germinal epithelium, the tunica albuginea, and the primordial follicles are preserved for at least four months in the males. These were the oldest cases examined. The follicles are smaller than in the females. The ovaries in general, however, are very similar to those transplanted upon the castrated females. In the females corpora lutea were found, but none were found in the males. He thus leaves undecided the question as to whether ova are shed from the ovaries in the male. His results are essentially the same as those obtained by Ribbert.

An Investigation of Striated Muscle, with Special Reference to Fatty Infiltration.—WALBAUM (*Virchow's Archiv*, vol. clviii., p. 170) concludes that fatty infiltration of striated muscle is common, while fatty degeneration is seldom met with. He has made an extensive survey of the literature. Personally he examined 119 cases. Fresh specimens teased out in tap-water gave the best results.

In cases of rhachitis no characteristic changes were found. Where the extremities were deformed no differences between flexors and extensors that might explain the deformity were present.

Changes in the number and character of the nuclei seemed unimportant. The fat droplets occur in longitudinal rows, the size of the droplets being determined by the width of the cross striations. In the levator palpebræ muscles the widest cross striations and the largest fat droplets were present. The amount of infiltration bore no apparent relation to the state of nutrition, the duration of the disease, or to the temperature-curve. Where fat was present no etiological factor could be discovered.

The muscles of the extremities, of the thorax, of the diaphragm, and of the eye were examined. In the order of frequency of involvement the levator palpebræ muscles came first, then followed the other eye-muscles and the remaining muscles. There was no striking relation between the age of the subject and the amount of infiltration except that in cases under one year there was very little involvement.

Together with the presence of fat there was no change in function, no decrease in size or degeneration of the fibres, no nuclear and no interstitial changes.

For these reasons he considers it an infiltration rather than a degeneration. As a general rule, the most active muscles contained most fat. He believes the fat is stored up in the muscle-fibres. Fatty degeneration was rare, and no etiology for it could be discovered.

On the Changes in Bloodvessels in Syphilis.—ABRAMOW (*Ziegler's Beiträge*, 1899, Band xxvi. p. 202) has studied the arterial changes in two cases of syphilis, in one of which no positive history was obtained.

Contrary to the usual course, the arterial lesions were confined mostly to the extremities and internal organs, while the vessels of the central nervous system were relatively very little affected.

His conclusions are as follows:

1. All three coats may suffer independently, the intima by proliferation of its endothelium, the adventitia by cellular infiltration, and the media by granular degeneration.
 2. When intima and adventitia are both affected they may penetrate the media and unite. No new elastic membrane (*membrana fenestrata*) is formed, and the rupture in the wall is filled with connective tissue, without any elastic tissue. This may easily lead to aneurism formation.
 3. The proliferative process in the intima may cease. In such cases the *membrana fenestrata* becomes very thick, then splits into many elastic fibres which penetrate and fill the newly-formed tissue of the intima.
 4. Only that arteritis is specifically syphilitic in which gummatous new formations are present. The presence of regressive changes in the new formation of the intima does not militate against the specific character of the lesion.
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CLINICAL NOTES OF CASES OF PERNICIOUS ANÆMIA.¹

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THIS paper is intended to be, for the most part, as its title implies, a clinical one. The cases described were studied at the bedside rather than in the laboratory. In their investigation instruments of precision were employed; not so much to determine the numerical relations of histological elements in each individual case as for purposes of diagnosis—in other words, to distinguish the disease pernicious anæmia from other diseases which it may resemble, and especially from latent gastric carcinoma.

In three of the five cases which I now report there were autopsies, and it is to be regretted that no histological studies of the post-mortem specimens were made. For this my responsibility is only indirect, as the examinations were made by the pathologists of the hospital in which the patients died.

CASE I. Profound anæmia, with all the characteristics of the pernicious type; peripheral neuritis, with paralysis of extensors; bronzing of skin, with freckle-like spots upon its surface. Result fatal.—Annie McC., aged sixty-four years, native of Ireland, domestic; admitted to Philadelphia Hospital, December 29, 1896. Family history excellent. Parents, brothers, and sisters well and strong up to advanced period of life.

History of present illness. The patient was also well and strong, with a good, healthy color, until one year ago, when well-marked gastrointestinal disturbances set in. These consisted of pain after eating, and frequent vomiting, with diarrhoea, which symptoms have persisted in greater or less degree up to the present time. The vomited matters consisted sometimes of the ingested food; at others solely of bile and mucus. In consequence she has lost much in weight, although is far

¹ Read before the Association of American Physicians, Washington, D. C., May, 1900.

from being "emaciated." During the period mentioned she has lived chiefly on milk, other food aggravating the above-mentioned troubles. There has, however, been almost complete anorexia.

Symptoms on admission. Great weakness and lassitude, shortness of breath, palpitation of the heart and præcordial oppression, with dull, aching pain in the epigastrium. Constriction of the waist, as by corsets, insupportable; cannot partake of solid food; but eggs, milk, and water cause little or no distress. A distinct systolic murmur, loudest at the apex, was heard and considered too harsh to be merely hæmic.

I took charge of the ward containing this patient on February 1, 1897, up to which time the blood had not been examined. The intense lemon-tinted pallor was highly suggestive of pernicious anæmia, and this diagnosis was confirmed by the first blood count, which was made on February 12th.

Number of red cells, 1,050,000 per c.mm.—21 per cent.; hæmoglobin, 25 per cent.; marked poikilocytosis. No estimate of the white cells, either absolute or relative, is recorded in the ward notes.

From this time until the patient's death, on June 23, 1897, the following counts were made:

March 15, 1897. Number of red corpuscles, 500,000; number of white cells, 5200; Hb., 19 per cent.

April 19th. Number of red corpuscles, 560,000; Hb., 14 per cent.

May 11th. Number of red corpuscles, 938,000; Hb., 36 per cent.; white cells, 3000.

June 18th. Number of red corpuscles, 375,000; Hb., 18 per cent.

The eye-ground was examined by Dr. Charles A. Oliver, who reported several hemorrhages scattered over the retina, the larger ones near the periphery.

From the voluminous ward notes of this case it appears that there was marked improvement as regards the digestive disturbances, with, however, occasional inexplicable attacks of diarrhœa and vomiting.

On February 19th the patient began to complain of a tingling sensation and numbness in feet and hands, and on March 3d these pains are recorded as being so severe as to elicit cries of pain.

The following note was made on March 15th: For several days the patient has been complaining of neuralgic pains in the feet and hands, and extending up the arms along the nerve trunks, with gradually increasing weakness and numbness, until to-day there is complete paralysis of extensors of hand and the same condition of those of the feet. She is unable to hold any object with either hand. Fowler's solution, which had been administered in doses of 10–20 drops for three weeks, stopped, the arsenic being regarded as a possible cause of the paralysis. Opposed to the hypothesis of arsenical neuritis is the fact that no gastrointestinal disturbance had been excited by the drug (on the contrary, that previously existing had subsided) or any œdema of the face. The patient at this date declared herself better, except as regards the neuritis, than for six weeks previously. Her statements are, however, unreliable, her mind being readily open to suggestions. The blood count at this date showed but 10 per cent. of red corpuscles.

April 23d. At this date a condition of slight general anasarca was noted, the face being œdematous, especially on the side on which the patient lay, and the hand hanging over the bed on the same side being decidedly swollen.

May 28th. For two or three weeks previous to this date there had been some improvement as regards the general condition, the patient sitting up occasionally, but the paralysis of the extensors remained complete. The following extract is from the ward notes of May 28th:

Watery diarrhoea continues; œdema of face and hands has entirely disappeared. The skin of the entire surface of the body has grown darker, with many brown patches, like freckles upon its surface, most marked on the hands and arms.

June 5th. This morning the patient is very weak, and since the disappearance of the œdema (which began to subside about ten days before this date) her emaciation is apparent. Her color is no longer typical of pernicious anæmia; skin is rather of a light-bronze tint; foot-drop still persists, although there is a little more power in its extensor tendons; hands much improved as to movements of extension.

On June 1st this patient passed out of my care, but from the notes it appears that the asthenia was rapidly progressive, and enhanced by rapidly recurring attacks of gastro-intestinal disorder. As above stated, death occurred on June 23, 1897.

The urine was repeatedly examined. On one occasion a trace of albumin was found, and on another a few small granular casts. Its specific gravity varied from 1014 to 1020.

A differential count of the leucocytes was recently made from a specimen of blood from this case by Dr. L. N. Boston, with the following result:

Polynuclear leucocytes	.	.	.	.	57	per cent.
Large lymphocytes	.	.	.	.	18	"
Small lymphocytes	.	.	.	.	20 5	"
Eosinophile cells	.	.	.	.	4 5	"

In counting 600 white cells 9 megaloblasts and 15 normoblasts were seen.

The following conditions were found at the autopsy:

Interstitial nephritis, ovarian cyst, multiple uterine fibroid tumors, atheroma of aorta, pericarditis in patches, vegetations in mitral valves, œdema of lungs.

CASE II. Profound anæmia following repeated epistaxis; characters of the blood as regards number of red corpuscles and percentage of Hb. the same as those of pernicious anæmia; convulsions following transfusion, the giver of the blood being epileptic; continued fever. Death.—Samuel B., aged seventy years, colored, sent to the Philadelphia Hospital from the House of Correction, February 10, 1897. No history of previous illness except rheumatism until two months ago, when after a blow on the nose epistaxis began. This has continued at intervals ever since.

On admission the patient was in a semi-comatose condition. The tongue was thickly coated, the breath offensive, the bowels loose, and the ocular conjunctiva yellow. A soft systolic murmur was heard over the base of the heart, and a few mucous râles at bases of lungs behind; the respirations were feeble and the heart-sounds distant and muffled. Temperature the morning after admission 102°; pulse 100, soft and compressible; respiration 20.

The first blood count was made February 21st. Number of red cells per c.mm., 1,357,000; number of white cells per c.mm., 5236. The Hb. was not estimated, nor is there any record of a differential count of the white cells.

It should have been stated that epistaxis was present on admission, and was arrested by tamponing the nares.

The condition of the patient steadily deteriorated until March 5th, when I determined to employ transfusion after the method of Brakenridge, of Edinburgh. This consists of the intravenous injection of blood kept fluid by admixture of one-third of its bulk of a 5 per cent. solution of sodium phosphate.

The marked success attendant upon this measure, reported by Brakenridge and Affleck fully warrants its employment in cases of pernicious anæmia which do not improve under purely medicinal treatment. The entire amount transfused by Brakenridge at one time, or rather by Duncan, who performed the operations, varied from two to six ounces.

The operation was performed by one of my surgical colleagues, Dr. John B. Shober, on March 5th. Six ounces of blood were obtained from a colored man, an epileptic, of about the same age as Samuel B., the patient. The blood was immediately mingled with two ounces of a 6 per cent. solution of sodium phosphate and the mixture injected into the cephalic vein of the right arm under all the usual antiseptic precautions.

During the operation the patient became very restless, with marked dyspnoea, and perspired profusely. About two hours after the operation his nose began to bleed, and also the wound in the bend of the arm where the transfusion was made.

March 6th. Passed a bad night; pulse frequent and feeble, beating at the rate of 140 most of the time. The temperature, which at the time of the transfusion and for weeks previously had reached 102° in the evening, rapidly fell until, at eleven P.M. of the 6th, it reached 96°. After that it rose as rapidly until the evening of the 8th it reached 102 8°. It then resumed its former course until the patient's death on April 16, 1897.

The general condition of the patient began to improve on the 10th of March, up to which time he had been in a semi-comatose condition, with muttering delirium, feeble, rapid pulse, and almost inaudible heart-sounds. The treatment during this period consisted largely of the hypodermatic administration of strychnine in doses of one-twentieth of a grain.

15th. Had a good night and was bright and cheerful in the morning. During the day he had three convulsions, each lasting but a few seconds and attended with unconsciousness. The spasm was limited to the muscles of the face, which was drawn toward the right side. On the 17th he bit his tongue during one of these spasms, which still remained limited to the right facial muscles. After this date the convulsions did not recur. Those convulsive attacks excited considerable comment on the part of those who were familiar with the case, on account of the remarkable coincidence, if it is nothing more, that the giver of the blood transfused into the veins of the patient was an epileptic.

31st. The blood was examined to-day with the following result: Red corpuscles, 660,000 per c.mm.; hæmoglobin, 17 per cent.; white cells, 3600 per c.mm.

Death occurred on April 16, 1897.

An autopsy was performed, of which the following notes were made: Tuberculosis (?) of mesentery and retroperitoneal glands. Emphysema of left lung. Effusion into both pleural sacs and into the pericardium.

Old pleural adhesions in right side. Chronic interstitial nephritis. Splenization of bone-marrow.

Exception may be taken to my regarding this case as one of pernicious anæmia, on the ground that the illness began with, and was kept up by, loss of blood. The characters of the blood were, however, those of pernicious, not those of post-hemorrhagic anæmia. This is especially shown by the figures of the last count, which gave 13 per cent. of red cells and 17 per cent. of hæmoglobin.

In post-hemorrhagic anæmia the percentage of hæmoglobin is, as a rule, decidedly lower than that of the red cells,¹ and, in addition, there is not only a relative but an absolute hyperleucocytosis. In the case of Samuel B. the number of the white cells was absolutely diminished. The splenization of the marrow of the long bones is also corroborative of the diagnosis of pernicious anæmia.

A differential count of the blood cells recently made by Dr. L. N. Boston gave the following result:

Polynuclear leucocytes	48 per cent.
Large lymphocytes	37 "
Small lymphocytes	12 "
Eosinophile cells	3 "

In counting, 600 white cells, 3 megaloblasts, and 7 normoblasts were seen.

CASE III. *Extreme anæmia, with percentage of color higher than that of number; marked gastro-intestinal disorder; great improvement under the use of arsenic and orexine.*—Andrew F., aged forty-two years; laborer; admitted January 23, 1898.

Family history good, both parents living to advanced age, one dying at eighty-five, the other at seventy-two. One brother died from accident, another still living; a sister died from typhoid fever.

Up to April, 1897, the only illness of any moment experienced by the patient was typhoid fever, with which he was attacked when twelve years old. In April last he had an attack similar to the present one, characterized subjectively by great prostration and dizziness, and objectively by extreme pallor.

The present illness began four weeks ago at Sparrow Point, near Baltimore. The first symptoms were chilly sensations, lasting more than a week, followed by painful throbbing of the head. Two weeks before the chills began it was noticed that he was becoming extremely pale. The appetite has been very poor, the bowels regular, and there has been cough with slight expectoration.

On admission he appeared much older than his age—forty-two years. His pallor was extreme, and the mucous membranes milky white. Vessels at base of neck pulsated strongly. Pulse frequent, quick, and soft.

Lungs yield normal signs except in right infra-clavicular region, which is slightly dull, and over which there is slightly increased vocal

¹ See chart in "Die Anæmie," by Lazarus, in Nothnagel's *Specielle Pathologie und Therapie*.

resonance. Apex beat of heart not visible, but palpable in fifth intercostal space in nipple line. Soft, blowing, systolic murmur at apex. Liver not enlarged. Area of splenic dulness slightly increased. Deep reflexes very slight. Digestion much disturbed; anorexia marked; vomiting induced by slight exertion, such as getting out of bed.

Eye-ground examined by Dr. Charles A. Oliver, February 3, 1898: "Well-marked neuro retinitis with both deep-seated and superficial hemorrhages in retina and optic nerve, most marked in right eye."

The urine was examined on several occasions and found free from albumin and sugar.

The blood was examined on January 25th, two days after admission:

Number of red corpuscles, 884,000 = 17.6 per cent.; hæmoglobin, 25 per cent.; white cells, 8500. Marked poikilocytosis.

January 31, 1898. Second blood count:

Number of red corpuscles, 792,000; white cells, 8620

March 18th. Number of red corpuscles, 2,520,000 = 50 per cent.; hæmoglobin, 65 per cent.; white cells, 2986.

At one of the blood examinations a stained specimen showed nucleated red cells with karyokinetic figures.

During the first three weeks of this patient's stay in the hospital no improvement was manifest. His appetite continued very poor and his stomach very irritable, with daily vomiting. Up to this time he had been taking Fowler's solution in gradually increasing doses up to ten minims. He was now given orexine (gr. ij t. i. d.), and coincidentally with its administration the appetite and digestion began to improve, and soon became almost voracious. On February 23d, it is recorded in the ward notes, he ate for his dinner four small chops, two potatoes, one egg, three slices of bread and a glass of milk. The increase in appetite may have been a mere coincidence, for I have since given orexine in cases of pernicious anæmia without any apparent influence upon the appetite.

The patient was discharged on April 7th, greatly improved, and, according to his own account, as well as he had been for years. His blood corpuscles, however, at the time, numbered less than 3,000,000 per c.mm.

With reference to this last point, *i. e.*, a state of well-being with 50 or 60 per cent. of the normal number of red cells, it would seem that in some cases of pernicious anæmia the possible maximum blood count is a low one. I have seen several cases in which patients with about 2,500,000 red corpuscles per c.mm. (*i. e.*, 50 per cent. of what is considered normal) declared themselves perfectly well and presented all the external signs of health. In one of the cases of this kind the patient, a man of high intelligence, being discouraged by the reports of the blood examinations, and finding himself in excellent condition, refused to have them continued, although he persisted in the use of the therapeutic measures from which he had derived so much benefit.

CASE IV. *Under observation six years, during which there have been several slight and two severe relapses, chronic gastro intestinal catarrh, with marked exacerbations preceding and during the relapses; complete restoration to health.*—W. P. O., aged fifty six years, male. This patient, an active and prosperous business man, a contractor, has been

under my observation since February, 1894, when I first saw him in consultation with Dr. L. D. Judd. At that time his anæmia was extreme, and his general condition apparently hopeless. In the course of a few months his health was completely restored; in fact, his general condition became better than ever before. During the last six years he has had several slight and two severe relapses, the latter in the spring of 1898 and the autumn of 1899 respectively.

The clinical history is taken almost verbatim from notes furnished me by the patient himself: "February 19, 1894. Complying with your request I will endeavor to repeat in writing the verbal report which I gave you on the occasion of your first visit. I was afflicted with a severe spell of the grip the first year of its appearance here (1889-90), coupled with a stubborn bronchial cold, and, although I became quite strong again and active, I have always since felt that I did not entirely recover from its effects. The latter part of July, 1892, I had some very important work to do in a very limited time at ——— (in the neighborhood of Philadelphia), and spent at least three hours there each day, anxious in mind and tired in body. I accomplished the work a little ahead of time, but it resulted in, or at least ended with, a severe and protracted spell of diarrhoea. I had been subject to similar but shorter attacks for several years. After completing the work referred to, the entire business was thrown upon me for about two weeks, during which the diarrhoea continued. I was relieved on August 19th, and sailed for Boston, hoping to recuperate on the New England coast. The sea trip was very hot, and I suffered severely. I returned the next day, took to bed and remained there for at least two months, being unable to take nourishment without experiencing great distress. Toward the first of the year, 1893, I was able to get down town for a short time each day, but did not improve satisfactorily. Early in February I contracted a cold which resulted in an attack of erysipelas that lasted about two weeks. My convalescence was rapid; the condition of my stomach improved, and I was able to take cod-liver oil. Under its use I gained in flesh until in the spring of that year I weighed 138 pounds, about eight pounds more than I had weighed for a number of years. During six weeks of the summer of 1893 I was at Canandaigua Lake, but owing possibly to indiscretions in diet the diarrhoea returned and my health again became worse. It was still further impaired by the fatigue incident to a visit to the Chicago Exposition. During the fall my health and strength steadily deteriorated until I reached the condition in which you found me in February, 1894."

When I first saw this man, on February 3, 1894, he was ghastly pale, gaunt and emaciated; in short, presented the appearance of an advanced case of pernicious anæmia. The diagnosis was confirmed by the negative results of a thorough physical examination and by an examination of the blood:

Number of red corpuscles per c. mm., 1,237,500; poikilocytosis marked; numerous microcytes; hæmoglobin, 30 per cent.; white cells not increased in number. At this time he weighed 118 pounds.

His symptoms at this time, apart from the sense of great muscular weakness and dyspnoea on slight exertion, were those of gastro-intestinal disorder. There was great uneasiness after eating, borborygmi, gaseous eructations and abdominal distention. The urine at this time was free from albumin and casts.

The treatment instituted on February 3d consisted of five grains of naphthalin in capsules thrice daily before meals, and three drops of Fowler's solution immediately after meals. He had a good appetite and was prone to over-indulge it. The diet was, therefore, carefully regulated and restricted. It was composed of chicken, fish, chops and eggs, rice, mashed or baked potatoes, and boiled or roasted onions, of which he was very fond. He was also allowed farinaceous food in the form of mush, hominy, and oatmeal.

The dose of the Fowler's solution was gradually increased until on February 22d he was taking eight drops thrice daily. Calomel in fractional grain doses was also given at frequent intervals to regulate the bowels. A few days after the naphthalin was ordered he complained of the after taste of the drug, and bismuth salicylate in five-grain doses thrice daily was substituted. These substances were ordered with a view to intestinal antiseptis. He also took two drachms of cod-liver oil twice daily.

On February 22d he weighed 128 pounds, a gain of ten pounds in less than three weeks.

March 12, 1894. Number of red corpuscles, 2,762,500 (55.2 per cent.); hæmoglobin, 50 per cent.; poikilocytosis still marked.

Patient has just returned from a week's stay at Atlantic City, and looks and feels much stronger. Dispenses with his carriage in going to business, preferring the cars. Complains of slight looseness of the bowels. He has been taking ten grains of Fowler's solution thrice daily for the last two weeks. This was ordered to be stopped. Is to continue with the bismuth salicylate, which he has also been taking steadily.

April 2, 1894. Number of red corpuscles, 4,000,000; corpuscles still slightly irregular in size and shape, some of them "tailed;" hæmoglobin, 60 per cent.

It is interesting to observe, as I have pointed out in other cases, how, as improvement progresses, the blood, as far as the relative percentages of color and number are concerned, assumes the character of chlorosis.

23d. The patient had just returned from a few days' trout fishing in Monroe County, Pa., and looked the picture of health. In spite of constant out-door exercise, he had gained four pounds in weight. Number of red corpuscles per c.mm., 4,275,000; hæmoglobin, 70 per cent. Corpuscles much more regular in outline; white cells not estimated, but very scarce.

June 1. Weight 143 pounds, ten pounds more than at any time during the last ten years. Number of red corpuscles, 4,450,000 = 89 per cent.; hæmoglobin, 80 per cent.

In the meantime the treatment previously mentioned had been continued, with occasional intermissions, under the skilful management of Dr. L. D. Judd. The improvement continued during the summer and autumn of 1894, his weight increasing to 145 pounds in summer. No further examinations of the blood were made until February 18, 1895, when I was again consulted. For a few weeks preceding this date the digestive disorders have recurred and the patient's weight has diminished to 132 pounds. The bowels are irregular, constipation alternating with loose motions, and occasionally a mass of mucus is voided *per rec-*

tum. There is no external evidence of anæmia beyond a slight sallowness of the skin. Number of red corpuscles, 3,130,500 = 62 per cent.; hæmoglobin, 50 per cent. Corpuscles vary greatly in size and shape; no white cells seen while counting the red.

May 23, 1895. Patient has just recovered from an attack of erysipelas. Is very thin, weighing but 120 pounds. Number of red corpuscles, 3,970,000 = 79 per cent.; hæmoglobin, 65 per cent.

September 14. Mr. O. has been in the Pocono Mountains all summer, and is in good condition, having regained his lost weight. The blood was examined at his request. Number of red corpuscles, 3,550,000 = 71 per cent.; hæmoglobin, 55 per cent. He was surprised at the low figures, which, he said, did not correspond to his sensations. I was rather averse to examining the blood for fear of just such a result.

I did not again see Mr. O. professionally until May, 1898, but was informed that during this long interval he was in good health and actively engaged in business.

May 19, 1898. It is evident that he is suffering from a severe relapse. The skin is of a lemon tint, the lips and palpebral conjunctiva bloodless. Number of red corpuscles per c.mm., 1,800,000 = 36 per cent.; hæmoglobin, 38 per cent. No white cells seen in fields counted, or, in fact, in the entire specimen of diluted blood beneath the microscope. From this relapse he recovered completely.

Another decided relapse occurred during the autumn of 1899. He had been in the city all summer, and hard at work all the time at his office.

October 10, 1899. Number of red corpuscles per c.mm., 1,930,000 (38 per cent.); hæmoglobin, 35 per cent. Under the use of arsenic, intestinal antiseptics, and occasional doses of calomel, with a careful regulation of the diet, improvement soon set in, and in a few weeks he was able to walk a short distance and to take long drives. His blood was not again examined until January 20, 1900, when he came to see me. He looked remarkably well, had resumed his business, and declared that he was, so far as his sensations were concerned, in excellent health. His red corpuscles, however, numbered but 2,700,000 per c.mm., and the hæmoglobin amounted to 50 per cent.

I have made no further examinations of the blood in this case, but I have recently seen the patient, who considers himself in the best of health, and whose general appearance is indicative of vigor and activity.

On three occasions during the last six years I have seen this man apparently rescued from death by the treatment above outlined, and especially by the use of arsenic in doses pushed to the point of tolerance. I need scarcely remind anyone that we are indebted to Prof. Byrom Bramwell, of Edinburgh, for our knowledge of the value of this drug in cases of pernicious anæmia.

CASE V. Extreme anæmia of less than one year's duration; pleuritic effusion of left side; death from erysipelas.—William T., aged sixty-two years, white, born in England, by occupation a wireworker; admitted to the Philadelphia Hospital January 25, 1900.

No disease since age of eighteen, when he had typhoid fever. Ten months before admission noticed that in the evening his feet and legs were swollen. Two months later he became decidedly short of breath,

and this dyspnœa has been increasing ever since. There is no pain, the appetite is fair, there are no marked digestive disturbances, and the patient sleeps well at night. For many years the man was a heavy drinker, but for the past year or two has refrained from the use of alcoholic liquors. He is of large frame and well covered with adipose tissue, but ghastly pale, the skin possessing the peculiar lemon tint of pernicious anæmia. Physical examination yielded negative results, except as regards the thorax, which on the left side was flat from the third rib downward in front, and below the spine of the scapula behind. Over this area, behind, the breath-sound was distant and bronchial, and the vocal and tactile fremitus completely absent. Two examinations of the blood were made in this case.

January 27. Number of red corpuscles per c.mm., 1,000,000 (20 per cent.); Hb., 20 per cent.

February 1st. Number of red corpuscles per c.mm. (average of two counts), 945,000 (19 per cent.); Hb., 18 per cent.

The corpuscles are irregular in shape, and their average size appears larger than normal. A few nucleated red cells (normoblasts) with deeply staining nuclei observed.

An ophthalmoscopic examination by Dr. Charles A. Oliver revealed "no coarse changes in either eye."

On February 16th the patient, who had been placed upon the use of arsenic, intestinal antiseptics, and orexine, and who was thought to be slightly improving, developed erysipelas, which involved the face and neck, and terminated fatally three days later.

An autopsy was held, of which the following notes are recorded:

"Body well-nourished; extremely anæmic; feet, legs, and thighs oedematous; abdomen containing 7000 c.c. of straw-colored fluid; left pleura contains 2000 c.c. of amber-colored fluid; entire pleura covered with a thick, well organized membrane; right pleura normal; heart cavities filled with liquid blood; no coagulum anywhere; valves and openings normal; coronaries slightly thickened; heart muscle shows increase of fibroid tissue; left lung is consolidated (from compression) and airless throughout; right lung emphysematous, with small scar at apex; liver pale, its capsule thickened, in a state of fatty infiltration, with slight increase of connective tissue; stomach normal as to size and thickness of walls; a few hemorrhagic spots on its mucous membrane."

The foregoing cases are selected from a number which have come under my observation during the last five or six years, because each of them possesses points of practical interest.

In Case I. there was paralysis of the extensors of the hands and feet, evidently due to peripheral neuritis. Whether this neuritis was toxic, induced by arsenic, or not, is an open question. It seems to me, however, that if such were the case peripheral neuritis would be of common occurrence in pernicious anæmia, most cases of which are treated with large doses of this drug. In one of the latest monographs¹ on pernicious anæmia it is stated that there are no symptoms of importance referable to the peripheral nerves.

¹ Die Anæmie, by Dr. A. Lazarus, II. Abtheilung, s. 137.

In the same case there was bronzing of the skin, which might have been caused by the arsenic exhibited, and in addition there were freckle-like spots scattered over the surface of the integument. In another case, an old man under my care at the Philadelphia Hospital a few years ago, the entire surface of the body was covered with spots precisely resembling freckles, but the skin was not bronzed.

In Case II. the occurrence of convulsions after transfusion with blood from an epileptic has been already alluded to. If these convulsions had occurred immediately after the operation of transfusion they might have been reasonably attributed to the circulatory disturbance to which it gave rise. As, however, they did not take place until ten days after the transfusion, the coincidence of convulsions in the giver and receiver of the blood seems to me to possess remarkable interest.

In Case III. improvement coincided with return of appetite, which seemed to be excited and maintained by orexine. It is only proper to add, however, that I have employed orexine to stimulate the appetite in other cases, and in vain.

Case IV. is remarkable for the success attendant upon the treatment pursued, and illustrates also the notorious tendency of pernicious anæmia to relapse.

Case V., which terminated fatally less than a month after admission, is added, not so much on account of its being a well-marked case of pernicious anæmia as because it illustrates, as does also Case IV., the tendency of the disease to be complicated with erysipelas.

In all five of the cases the blood presented the characters which are universally accepted as those of pernicious anæmia, namely, extreme reduction in the number of the red corpuscles and relatively high percentage of hæmoglobin. All other blood changes in this disease, such as poikilocytosis, microcytosis, and the presence of nucleated red cells, large and small, are, from the practical stand-point of diagnosis, of subordinate importance. According to my experience there is no disease, except pernicious anæmia, in which the number of the red corpuscles is at any time reduced below 20 per cent. of the normal—*i. e.*, below 1,000,000 per c.mm. The disease with which pernicious anæmia is most apt to be confounded is, undoubtedly, latent gastric cancer. Marked digestive disturbances, extreme cachexia, and sometimes great emaciation are common to both, but the state of the blood, as regards the number of the red corpuscles, is widely different in these two affections. As I have said elsewhere,¹ I have never seen a case of gastric cancer in which the number of the red corpuscles was reduced below 30 per cent.—*i. e.*, below 1,500,000 per c.mm., and I have found in the blood of such a case a few days before death 2,760,000 red corpuscles

¹ Archiv für Verdauungskrankheiten, Band iv., Heft 1,

per c.mm.—i. e., 45 per cent. of the normal number, while the percentage of color was but 20. In another case of advanced gastric carcinoma I found 60 per cent. of red corpuscles and 55 per cent. of hæmoglobin; in still another, 80 per cent. of red corpuscles, and so on. Such figures, in my experience, absolutely exclude pernicious anæmia. I have had under my care at the same time, in the same hospital ward, two cases—the one suffering from pernicious anæmia, the other from gastric cancer. The latter was far weaker than the former, while his red corpuscles were four or five times more numerous. In cancer of the stomach the oligocythæmia does not keep pace with the cachexia; in pernicious anæmia the cachexia does not keep pace with the oligocythæmia. In this connection I would call attention to the fact that the muscular strength and the powers of endurance are often remarkably well preserved in advanced cases of pernicious anæmia. For example, in the notes of a case which I reported in collaboration with Prof. Osler in 1886,¹ it is recorded that the patient “came to have his blood examined, walking a distance of nearly two miles. Was not fatigued, but complained of a slight numbness in the legs.” At that time the red corpuscles numbered 1,215,000 per c.mm. (24 per cent.), and the percentage of hæmoglobin was 28. A similar case is recorded by Laache, the patient walking three kilometres, the entire distance being *up hill*, when his blood contained less than 1,000,000 red corpuscles per c.mm.²

To return to the question of the comparative number of the red corpuscles in gastric cancer and pernicious anæmia: In the former disease, when well advanced, in fact up to the point of death, I have found the number of the red corpuscles to range between 2,000,000 and 3,000,000 per c.mm., and sometimes to exceed the latter figure. On the other hand, I have never seen a case of pernicious anæmia in which, before death, the number of the red corpuscles did not fall far below 1,000,000 per c.mm. The comparatively high blood count of gastric cancer has been observed by others, and is, I presume, generally accepted as a characteristic of the disease. For example, Laache found 3,489,200 red corpuscles per c.mm. (about 70 per cent.) in a case of cancer of the stomach and liver less than two months before death;³ 67 per cent. in another; 43 per cent. in a third, and 57 per cent. in a fourth. Similar figures have been published by Stengel,⁴ who found an average hæmic unit of 58 in three advanced cases of gastric carcinoma. Contrast these percentages with 7, 10, and 18, which are those I have frequently found in advanced cases of pernicious anæmia. It is my opinion, as the result

¹ AMERICAN JOURNAL OF THE MEDICAL SCIENCES, April, 1886.

² Die Anämie, S. Laache, 1883, p. 147.

³ Loc. cit., p. 63.

⁴ Therapeutic Gazette, June, 1894.

of many years' observation, that the differential diagnosis between pernicious anæmia and latent gastric cancer, and consequently the diagnosis of these two diseases, may be more certainly made by a blood-count than by any other method, not excluding a chemical examination of the gastric contents. In fact, the latter may be misleading, as, for example, in cases of pernicious anæmia associated with extensive atrophy of the gastric mucosa. In such cases anacidity, which is a characteristic of gastric cancer, is present, as a matter of course. In the case already referred to, which was reported by Prof. Osler and myself, there was total destruction of the mucous membrane of the stomach. If in that case the stomach contents had been tested for HCl, the result would of necessity have been negative, and, therefore, misleading. The case was studied in 1886, before the importance of anacidity as a symptom of gastric cancer was generally recognized, and, therefore, the diagnosis was based upon the most reliable sign of pernicious anæmia, the reduction of the number of the red corpuscles to about 25 per cent. of the normal.

I admit the possibility of the reduction of the number of the red corpuscles in gastric cancer to 40 or even to 30 per cent. of the normal—*i. e.*, to figures characteristic of pernicious anæmia, although I have never met with such a condition. Supposing such a case to exist, I would regard it as one of pernicious anæmia complicated with gastric cancer, or as one of gastric cancer complicated with pernicious anæmia, for the figures last mentioned are characteristic of pernicious anæmia and not of gastric cancer.

The relatively high percentage of hæmoglobin, which is so characteristic of the blood of pernicious anæmia, depends upon two, perhaps upon three causes, of which but one is generally recognized: 1. It depends upon the increased average size of the red corpuscles, each one containing more than the normal amount of hæmoglobin. 2. Upon the fact that in some cases there is an unusual number of microcytes, which are so highly colored and so minute that they have been compared to "small, red-tinged, fat globules." They are much better seen in a dried smear of blood than in the diluted blood from which the count is made. Whether seen or not, they are not counted, and, therefore, contribute to raise the percentage of color. 3. A high percentage of hæmoglobin may depend upon the time at which the examination of the blood is made. Hunter has called attention to the fact that exacerbations of the disease coincide with an increased yellowness of the skin, sometimes amounting to icterus, and a deeper color of the urine, the latter being due to the presence of pathological urobilin, and all dependent upon increased hæmolysis. In other words, the icteric tinge of the skin and the deeper hue of the urine are hæmatogenous—*i. e.*, caused by a disso-

lution of the red blood-corpuscles. Now, if the hæmoglobin is estimated during one of these periods of exacerbation, its percentage will, as a matter of course, be higher than previously or subsequently, since the more highly-colored plasma contributes to its elevation. This is a point to which, as far as I am aware, attention has not hitherto been directed.

In conclusion, I would reiterate the theory announced by me in 1886,¹ and quoted with approval by the late Prof. Harrison Allen at the third Triennial Congress of American Physicians and Surgeons,² that the red blood corpuscles in pernicious anæmia show marked signs of reversion to the type of blood which is normal in the cold-blooded animals. This theory might be regarded as fanciful if it were based upon a resemblance of the blood of pernicious anæmia to that of the cold-blooded animals (frogs and eels) in any one particular, but the fact is that the red corpuscles of pernicious anæmia resemble those of the said animals in their number, their size, their shape, and the amount of hæmoglobin they carry. In well-marked cases of pernicious anæmia we observe (1) a reduction of the number of the red corpuscles to a degree that is normal in the cold-blooded animals. It is the rule to find in this disease, when well advanced, less than 1,000,000 corpuscles per c.mm. Figures like these are normal in the cold-blooded animals. (2) In pernicious anæmia many of the corpuscles are much increased in size, so much so that they have received the name of megalocytes. Many of them are quite as large as the corpuscles of the lizard and eel. (3) They often show a tendency to assume an oval outline, which is that of the corpuscles of the cold blooded animals. And (4), finally, to make the resemblance complete, nucleated red corpuscles are commonly present in the blood of pernicious anæmia.

Dr. C. S. Engel,³ of Berlin, has recently discussed the question whether pernicious anæmia is an example of reversion to the foetal mode of blood development, and, after an elaborate and minute comparison of foetal blood in all its stages with the blood of pernicious anæmia, he decides it in the affirmative. Such observations tend to support the view just advanced, for, according to all analogy, the blood-corpuscles of the human embryo in their various stages of development should correspond with those of adult animals on lower planes of evolution.

¹ Philadelphia Medical Times, April 3, 1886.

² Trans. of the Congress of Am. Phys. and Surg., vol. iii. p. 9. "Morphology as a Factor in the Study of Disease."

³ Virchow's Archiv, Band clix., S. 537.

PERNICIOUS ANÆMIA: A STUDY OF ONE HUNDRED AND TEN CASES.¹

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THE diagnosis in these cases rests upon the following evidence :

1. Autopsy (in addition to clinical evidences)	19 cases
2. Typical symptoms, signs, blood examination, and course, ending in death—no autopsy	60 “
Typical symptoms, signs, blood examination, and course, but not known to be dead (lost sight of)	19 “
3. Typical symptoms, signs, blood examination, and course, but still alive (recent cases)	12 “
Total	110 “

These figures will be further discussed later on, but are given here simply to indicate what is included in the paper. In addition to these 110 cases I have seen 22 others, which I think were probably cases of pernicious anæmia, but in which a full account of the histology of the blood or some other item necessary to diagnosis is lacking.

ETIOLOGY. Among my cases there has been a slight preponderance of males: 57 males to 53 females. The majority of the cases have occurred after the fortieth year; in fact, only 28 occurred at an earlier age. I have had no typical cases under nine years of age. I say no typical cases, for though I have known fatal cases of anæmia in younger children, the anæmia has always seemed to me to be of a different type from that occurring in older persons. Sixty-three of these cases occurred between the fortieth and the sixtieth year, 19 were over sixty, 4 over seventy, the oldest being seventy-nine.

All of these cases came from Boston or its vicinity, and almost all professions and walks of life were represented. One fact which surprised me was the occurrence of no less than seven cases in the wives of physicians.

In four cases the symptoms began immediately after parturition or during the previous pregnancy. Of a relationship to the time of the menopause it is difficult to make any accurate statement, since the catamenia always stops when the anæmia begins. Fourteen cases occurred at about the time when the menopause is to be expected. No definite relationship with syphilis or with intestinal parasites could be traced in any case. There was a history of tertian malaria in four, but nothing pointed to its being the cause of the anæmia. Hemor-

¹ Read before the Association of American Physicians, Washington, D. C., May 1, 1900.

rhage played a part in the symptomatology of thirty-seven cases, but in no case preceded the onset of the other symptoms. The source of hemorrhage in these cases was as follows :

Bowel (including piles)	15
Nose	13
Gums (steady oozing in 2)	12
Stomach	7
Uterus	3
Lungs	2
Skin	2
Ear (1 pint lost on one occasion)	1
Kidney	2

Two cases were complicated by diffuse nephritis. There was no relation to cancer in any. Psychic factors were prominent in three cases. In one of these the patient's symptoms dated from the time when it was her misfortune to witness the suicide of her son.

FREQUENCY. The fact that so many cases came within my personal observation within seven years seems to me to show that the disease is more common than is usually supposed.

SYMPTOMS. On the whole, the most striking thing to me as I look over these cases is the uniformity and monotony of the symptomatology. One case is remarkably like another. Again, I am surprised at the relative freedom from symptoms in many of them. Several times I have had to restrain patients from going to work, although their red corpuscles numbered less than 2,000,000 per c.mm. Other patients with blood equally impoverished have told me that they felt almost if not quite well.

The gravity of such symptoms as are present does not seem to be in any way proportional to the impoverishment of the blood. Cases with only half a million corpuscles often feel better than others with a million and a half.

Again, it should be mentioned that pernicious anæmia is compatible with a very fair color in the cheeks. I have had three cases with typical signs and symptoms of pernicious anæmia in whom, from the appearance of the face, one would never have suspected the diagnosis.

The earliest as well as the most frequent of all symptoms is *muscular weakness*. In two cases this was the only complaint when the patient first came under observation. Next to this, the earliest as well as the most frequent complaint was of *pallor*, which in the great majority of cases had the pale yellow cast so often spoken of. This tint, while I do not think it can be held to be peculiar to pernicious anæmia, is certainly a very suggestive symptom ; but it is rather the combination of yellow pallor with plumpness in the face which makes us suspect the presence of pernicious anæmia.

Next to these symptoms in the order of frequency is *dyspnœa*, then *gastric symptoms*—nausea or vomiting, which were nearly as common as those last mentioned. It is noteworthy that in fifty-seven cases the vomiting occurred without any antecedent nausea. In this series, as in that previously published,¹ I found it characteristic of the disease that gastric symptoms occur *paroxysmally*, with intervening periods of relatively good digestion. This fact speaks decidedly against the supposition that the changes in the gastric mucous membrane (which are present, no doubt, in many cases) are such as to cause a serious impediment to digestion or absorption. Atrophy of the gastric tubules cannot come and go as the symptoms do.

Lack of appetite was complained of in not more than two-thirds of the cases. One patient said he never could get enough to satisfy his appetite. Swelling of the lower extremities was a fairly constant although a relatively late symptom. Palpitation was complained of much less than dyspnœa. Physical examination of the heart showed in most cases nothing more than the functional murmurs which we expect in any anæmia. They are usually less marked in pernicious anæmia than in chlorosis. In seventeen cases there was evidence of mitral regurgitation, and in six of these cases an enlargement of the heart was demonstrated.

The condition of the *bowels* was abnormal in the majority of cases. Diarrhœa occurred paroxysmally in 43 cases and constipation in 32. Symptoms referable to the *nervous system* were as follows: Vertigo was complained of in about half the cases; headache in 34; ringing in the ears in 30; while signs and symptoms suggestive of changes in the spinal cord were present in 31. Difficulty of vision was mentioned in 20 cases.

Retinal examination was made in 36 cases. Of these 15 showed retinal hemorrhage; 21 showed a normal retina.

Enlargement of the *liver* could be demonstrated in 30 cases, and of the *spleen* in 13. About half the cases showed evidence of emaciation, while in the remainder the fat layer was well preserved. Fever occurred in about two-thirds of the cases, ranging from 100° upward in 23 cases; in 26 the temperature was constantly normal or subnormal. The urine was normal in 53 cases; showed the presence of albumin in 23 cases, with casts in addition in 21. It was usually pale or normal in color; only twice was it dark.

THE BLOOD. There are undoubtedly periods in the course of most cases of pernicious anæmia in which the diagnosis cannot be made by the blood examination alone. The same can be said of malaria. But it is further true that the condition of the blood in a case of pernicious

¹ Boston Medical and Surgical Journal, 1896.

anæmia may vary a great deal from day to day, so that it is unsafe to draw conclusions from a single examination; for example, I have repeatedly failed to find any megaloblasts at the first examination, yet had no difficulty in discovering them a day or two later. Through reliance on the findings of a single examination I have twice made mistakes in diagnosis.

Regarding the characteristics of the blood in the active stages of the disease, I have nothing to add to what I have previously said in other writings;¹ but comparatively little has been written regarding *the condition of the blood during the remissions of the disease*. This I have had an opportunity of observing in many cases, and have noted the following facts:

1. THE COLOR INDEX. When the red corpuscles begin to increase the color index may remain relatively high or even become still higher; but in the majority of cases this is not so. As a rule, in the remissions of the disease the hæmoglobin is relatively low, as in ordinary symptomatic anæmia, and I have seen two cases which, if examined for the first time during the period of remission, would have certainly been mistaken for ordinary chlorosis.

2. THE LEUCOCYTES. Coinciding with the increase in the red cells there is usually a still greater increase in the leucocytes, so that for a time a moderate leucocytosis may be present. This increase is made up very largely of polymorphonuclear neutrophiles, and is due, no doubt, to the increased activity of the marrow through which both red corpuscles and granular leucocytes are multiplied. As the percentage of polymorphonuclear neutrophiles increases the percentage of lymphocytes decreases, and the myelocytes, which are usually present in small percentages during the active stages of the disease, disappear. The number of megaloblasts steadily decreases, and in their place normoblasts appear for a time; later they, too, leave the circulating blood. The size of the individual red cells is sometimes greater during a remission of the disease than at any other time. In one remarkable case the patient, whose symptoms had totally disappeared and who was actively at work as a newspaper correspondent, dropped in to see me one day, apparently in splendid health and spirits. His skin and mucous membranes were ruddy red, his hæmoglobin 100 per cent., yet to my great surprise I found only 2,500,000 red cells to the cubic millimetre. The stained specimens showed the largest red cells which I have ever seen, for the most part perfectly well shaped and natural looking, but averaging 12μ in diameter. This stage is, however, a comparatively short one, and the size of the red corpuscles soon becomes normal or subnormal. The abnormal staining reactions and the oval forms disappear.

¹ For summary of blood examination in 110 cases, see next page.

As a rule, the count of corpuscles does not remain long above 4,000,000, but ranges in the neighborhood of 3,000,000 during the greater part of the remission.

Summary of the conditions found in the blood of 110 cases at the time of the first examination :

<i>a.</i> Red cells numbered :						
From 500,000 to 1,000,000 in	.	.	.	.	.	27
“ 1,000,000 to 1,500,000 in	.	.	.	.	.	45
“ 1,500,000 to 2,000,000 in	.	.	.	.	.	34
						<hr/>
Total cases under 2,000,000	.	.	.	.	.	106
From 2,000,000 to 2,500,000 in	.	.	.	.	.	4
						<hr/>
						110
<i>b.</i> Leucocytes numbered :						
Under 1,000	.	.	.	.	.	9
1,000 to 3,000	.	.	.	.	.	23
3,000 to 5,000	.	.	.	.	.	40
5,000 to 7,000	.	.	.	.	.	24
7,000 to 10,000	.	.	.	.	.	12
10,000 to 13,000	.	.	.	.	.	2
						<hr/>
						110
<i>c.</i> Hæmoglobin :						
Relatively high in	.	.	.	.	.	79
Not relatively high in	.	.	.	.	.	31
						<hr/>
						110
<i>d.</i> Average diameter of red cells at time of final examination :						
Increased in	.	.	.	.	.	89
Not increased in	.	.	.	.	.	21
						<hr/>
						110
<i>e.</i> Megaloblasts at time of final examination :						
Predominate in	.	.	.	.	.	87
Later examination, predominate in	.	.	.	.	.	20
Only one examination, no megaloblasts	.	.	.	.	.	3
						<hr/>
						110
<i>f.</i> Lymphocytes between 20 per cent. and 30 per cent. in						
“ “ 30 “ “ 40 “	.	.	.	.	.	34
“ “ 40 “ “ 60 “	.	.	.	.	.	33
“ “ 60 “ “ 80 “	.	.	.	.	.	6
“ “ 80 “ “ 90 “	.	.	.	.	.	3
						<hr/>
						110
<i>g.</i> Eosinophiles :						
Under 4 per cent.	.	.	.	.	.	90
Over 4 per cent.	.	.	.	.	.	13
None found	.	.	.	.	.	7
						<hr/>
						110

h. Myelocytes. Present in 66 cases. Highest percentages:

10 per cent. in	.	.	.	.	.	.	.	.	2
9 " "	.	.	.	.	.	.	.	.	1
8 " "	.	.	.	.	.	.	.	.	2
7 " "	.	.	.	.	.	.	.	.	2
									<hr/> 7

DIAGNOSIS. In view of the fact that there are but nineteen autopsies in my series, the question may be raised whether I have not included cases of latent gastric cancer or other disease, of which the anæmia was but a symptom. My reasons for thinking differently are as follows:

(a) In each of the nineteen cases in which an autopsy was obtained, the symptoms, the signs, the course of the disease, and the condition of the blood were of a definite and characteristic type, practically identical in every case, and differing in important respects from the conditions seen by me in any one of several hundred cases of well-identified symptomatic anæmia of equal severity.

(b) For purposes of comparison I have carefully studied the symptomatology, course, and the condition of the blood in several hundred cases of anæmia, obviously symptomatic, occurring in the course of æstivo-autumnal malaria, gastric cancer, or nephritis—all of them cases as severe as those included in my present series—that is, all of them showing less than 2,000,000 red cells per cubic millimetre. A very rich material for this study was furnished by the cases of malaria occurring in the soldiers returning from the late war in Cuba. Despite the most careful study of these cases, I have never been able to find any in which the symptoms, signs, course, and the condition of the blood were like those occurring in the nineteen cases of pernicious anæmia with autopsy, mentioned above.

The distinctive features in the diagnosis of pernicious anæmia are as follows:

1. A slow, insidious onset without recognizable cause.
2. Remarkable freedom from pain.
3. Striking absence of emaciation (in most cases).
4. The frequent presence of symptoms suggesting disease of the spinal cord.
5. Paroxysmal attacks of diarrhœa and vomiting, occurring without any obvious relation to diet or to treatment, preceded and followed by periods in which digestion and absorption were performed without apparent difficulty.
6. The tendency to great spontaneous improvement in all the symptoms, followed by rapid and inevitable relapse.
7. A reduction in the red corpuscles to a point below 2,000,000 per cubic millimetre, without a corresponding reduction in the hæmoglobin; a reduction in the number of leucocytes, and especially in the number

of polymorphonuclear neutrophiles; the presence of large numbers of oversized, well-stained red corpuscles, some of them containing nuclei (megaloblasts), together with a tendency to abnormal staining reactions and to an oval shape in the red corpuscles.

The distinctive features in the diagnosis of secondary or symptomatic anæmia are :

1. The presence of a well-recognized cause.
2. The steady progress of the symptoms, especially in malignant disease. If gastro-intestinal symptoms are present they seldom improve spontaneously.
3. Emaciation.
4. The blood.

This tissue shows usually a relatively low percentage of hæmoglobin, and the number of leucocytes, and especially of polymorphonuclear neutrophiles, is apt to be increased, although this is by no means invariable. The size of the individual red cells is usually normal or diminished and their centres strikingly pale. Oversized red corpuscles may be present and may occasionally contain nuclei; but, as a rule, they are greatly in the minority, and such nucleated red corpuscles as are present are chiefly of the normoblastic type. The tendency to abnormal staining reactions and to an oval shape in the red corpuscles is usually much less marked than in pernicious anæmia.

(c) Having established to my own satisfaction the existence of two types of anæmia—the one (pernicious anæmia) on the basis of nineteen autopsies and of a definite type of symptoms and signs occurring in every case; the other (secondary anæmia) recognized by the existence of an obvious cause, according to the action of which the symptoms progressed or ameliorated—it seems to me justifiable to conclude that the other cases of my series, which were clinically identical with the nineteen on which an autopsy was obtained, were cases of pernicious anæmia, and would have shown typical changes at autopsy, had this been obtainable.

Practically, latent gastric cancer with anæmia is the only disease which anyone is likely to confuse with pernicious anæmia. In all such cases which have come under my observation the symptomatology and course, as well as the condition of the blood, has been very different from that of typical pernicious anæmia. It is true that in two cases of typical pernicious anæmia, diagnosed as such by Ehrlich himself, a cancerous nodule the size of a walnut was found in the stomach post-mortem; but in such cases I see no sufficient reason for believing that the cancer was the cause of the anæmia. Cancerous growths are not usually accompanied by any considerable degree of anæmia until they have reached a considerable size. It seems to me more reasonable to suppose that in Ehrlich's cases the cancerous nodules occurred as a

complication and not as the cause of the anæmia. Latent cancerous growths complicating other diseases have been repeatedly found, and no one would consider a case of nephritis or of phthisis due to cancer of the stomach because such a growth was found in the stomach post-mortem.

(d) "*A priori* (Askanazy and other writers have said), there cannot be a distinction clinically between pernicious anæmia and secondary anæmia, because there is no distinction in the marrow between normoblast and megaloblast." This is not upheld, however, by later research. Pappenheim's work goes to show that there are two types of blood formation—the foetal and the adult—with two types of corpuscles, differentiated, not, as Ehrlich supposes, by the fate of their nuclei, nor, as has often been stated, by the size and staining affinities of their nuclei, but chiefly by the size of the whole cell and by the characteristics of the nuclear network. It is practically though not strictly true to say that a megaloblast is an abnormally large red corpuscle with a nucleus of any kind, while a normoblast is a normal-sized red cell with any kind of nucleus. Large, pale nuclei are simply young nuclei.

(e) It is a common mistake to suppose that by pernicious anæmia we mean simply a very severe or fatal anæmia. But pernicious anæmia is not always very severe; there are relatively mild cases which run on for several years and are compatible with a very fair degree of health, although always fatal within six years, so far as my observation goes. On the other hand, a case of secondary or symptomatic anæmia, such as that due to hemorrhage or to malaria, may be rapidly fatal and yet is easily distinguishable from pernicious anæmia by its symptomatology and by the condition of the blood. I have no experience leading me to believe that there is any such condition as "secondary pernicious anæmia."

(f) In the initial stages of the disease and during remissions diagnosis may be impossible. The same is, of course, true of many of the best known diseases.

(g) The anæmia due to intestinal parasites, especially to the *bothriocephalus latus*, is entirely indistinguishable from pernicious anæmia. This has been abundantly proved by the magnificent monograph of Schumn, and if we are to consider *bothriocephalus* anæmia as *secondary*, as it seems natural to do so, we must admit that this particular type of secondary anæmia is absolutely indistinguishable from the so-called primary or pernicious anæmia.

A word may here be said regarding the use of the term "primary anæmia," which means to me simply an anæmia of whose cause we are ignorant. None of the causes as yet adduced to explain pernicious anæmia seem to me satisfactory, although I think there is a good deal of evidence for believing that it is due to a poison absorbed from the

gastro-intestinal tract and exerting its deleterious effect upon the blood, the heart, the spinal cord, and the gastro-intestinal tract itself. Among these changes I am by no means sure that the anæmia is the most important, and I regard the others as co-ordinate with it rather than as resulting from it. This view is, to my mind, supported by the fact that the severity of the clinical symptoms is not by any means proportional to the degree of blood impoverishment.

COURSE. In 90 cases I have accurate data as to the course and progress of the disease; in the others my records are somewhat defective. Out of these 90 only 20 were progressive. In 70 there was one or more remissions in which great improvement took place, the symptoms for the most part disappearing, the patient's color and blood-count becoming nearly or quite normal. Twenty-one of these cases were able to return to work, and felt as well as ever.

Although it is well-known that pernicious anæmia is not a progressive disease, but comes upon the patient in successive waves or paroxysms, I think the full significance of these facts has not been realized. But a short time ago I was talking with a member of this Association, who seemed inclined to doubt the diagnosis of a case of pernicious anæmia because the improvement of the case had been so marked and so rapid. I desire, therefore, to emphasize the point that the disease rarely goes on progressively from bad to worse, and should be expected to show one or more waves of great improvement—improvement which for the most part occurs without any relation to treatment, and which treatment has no power to render permanent.

I have thought it of interest to put together the rate of improvement in some of my cases:

In Case VII. of my series the red cells increased from 1,800,000 up to 5,200,000 in fourteen days. In Case XXXIX. the red cells increased from 2,200,000 to 4,000,000 in thirteen days. In Case LVIII. the red cells increased from 1,500,000 to 3,200,000 in twelve days. In Case XCI. the red cells increased from 1,700,000 to 3,000,000 in fourteen days.

Similar observations have been reported by Ehrlich and other observers.

It is quite possible, although I have no figures to prove it, that in the periods of decline the red corpuscles may fall as rapidly as they subsequently rise. This possibility is suggested by the fact that one rarely sees pernicious anæmia in an early stage—that is, until the red corpuscles have fallen below 2,000,000 per cubic millimetre. Only four of my cases showed more than 2,000,000 red corpuscles per cubic millimetre at the time of the first examination of the blood.

PROGNOSIS. Of the seventy cases which I have been able to follow from start to finish the majority have lasted less than two years; only

twelve lasted more than three years, and only two more than four years, the longest being five years. The number of relapses varied from two to five or six. It has seemed to me that such relapses were especially apt to occur in the early spring, and I think it not impossible that a more direct relationship between the progress of the cases and the weather may later be demonstrable. Remissions may occur even after the red cells have fallen as low as a half million per cubic millimetre. In one of my cases the patient went steadily down hill for four months, until he was too weak to leave his bed, and finally became comatose, with convulsions. At this time he was not expected to live through the night, yet he subsequently recovered sufficiently to be able to do light work about his farm. In the active stages of the disease continuous fever may be present, and in two such cases the diagnosis of typhoid was made.

Out of the whole series there has not been one genuine recovery, so far as I am aware. Of the twelve who are known to be still alive eight have been under observation only a few months, and are fast going down hill. Of the other four, two have been under observation for two years, one for two and a half, and one for three and a half years. In the latter case the condition of the blood is now entirely normal, except for a moderate diminution in the hæmoglobin. The patient feels entirely well.

Of the nineteen whom I have lost sight of the majority were getting rapidly worse when last heard from.

DURATION. Of the seventy-nine cases regarding which I have complete data, including the date of death—

30	lived	less	than	1	year	from	the	earliest	symptoms.
20	"	"	"	2	years	"	"	"	"
10	"	from	2	to	3	"			
7	"	"	3	to	4	"			
3	"	"	4	to	5	"			

TREATMENT. Most of these cases received Fowler's solution in gradually increasing doses continued over long periods. In eight of them bone-marrow was used, either alone or with Fowler's solution. In three of them inhalations of oxygen were given. Personally I do not believe that any of these therapeutic agents have any effect on the course of the disease. I have seen great improvement follow each of them, but when the inevitable relapse later took place the use of the same remedies proved unavailing. On the other hand, I have several times seen sudden improvement occur and the blood-count become normal when absolutely no medicine was being given. Several times such improvement followed immediately upon or coincided with an attack of diarrhoea, as if the increased intestinal peristalsis had removed from the system substances which were poisoning it. Acting upon this sugges-

tion, I have of late treated several cases with laxatives or purgatives, in the hope of preventing thereby the absorption of poisonous substances from the intestines. As to the results of such treatment I am not yet prepared to speak.

EXPERIMENTAL RESEARCH SHOWING THAT URIC ACID
SECRETION IS NOT REGULARLY DIMINISHED IN
THE PERIOD PRECEDING EPILEPTIC
SEIZURES.

BY JAMES J. PUTNAM, M.D.,
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AND

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THE toxic theory of disease-processes, and especially of the periodical and occasional neuroses and psychoses, has so warmly commended itself to the minds of physicians of our generation, and has been utilized with such eagerness as a basis of therapeutics, that sufficient pause has not often been made to ascertain whether the data on which the clinical statements have been based would stand the searching test of really accurate and critical analysis.

For my own part, I believe that the point of view itself has often been wrong, and that, at least so far as the neuroses and psychoses are concerned, it may prove that the toxic theory of their pathogenesis should take a subordinate place, and that a more fruitful line of research would be one that looks on these affections as caricatures of normal states, their peculiarities being expressible, no doubt, in chemical terms, but better, it may turn out, in those of physiological reaction or anatomical structure.

This search for toxic causes has naturally been especially active with regard to epilepsy, and has been held by many observers as representing, indeed, the only rational outlook for an explanation of its symptoms, though of late the "inhibition" theory, as expressed, among others, by Oddi, the Italian physiologist, has been advanced as a promising alternative.

One of the most recent supporters of the toxic theory of epilepsy is Kräinsky, a Russian physician and chemist, who has made several long series of apparently painstaking experiments, the results of which are recorded in the *Zeitschrift für Psychiatrie*, 1898, and elsewhere. This paper opens with the very positive and reiterated statement, on which, indeed, the final reasoning and conclusions are based, that the excretion of uric acid is invariably diminished before each outbreak of "idiopathic" epilepsy, the diminution sometimes immediately pre-

ceding the attack, sometimes being separated from it by an interval of normal excretion for a day or two. Immediately after the seizures the uric acid excretion rises again, he says, to above the normal, so that the total excretion for the whole period equals the normal quantity. He does not agree with Haig in thinking this substance to be the direct cause of the attack, but regards the variations in its excretion as corresponding to other chemical changes, through which the real poison is formed. For him this poison is carbaminic acid, but into the soundness of this hypothesis we shall not here attempt to enter.

Having been interested for some time past, together with Dr. Pfaff, in studying the uric acid question, I asked him to test the validity of Kräinsky's statement as to the invariable diminution of the excretion above referred to, which, if proved to occur, would be a very important fact, as showing that the epileptic attack is led up to by changes in general metabolism.

The research does not cover a large number of cases, but so far as it goes it is accurate. Not only were the analyses made by an assistant especially trained for the work and under Dr. Pfaff's personal supervision, but control analyses were made in every instance, and all results rejected which were not thus confirmed, except in two instances.

The urines were sent to Dr. Pfaff daily from the Massachusetts State Hospital for Epileptics, at Monson, through the kindness of the Superintendents, Dr. Owen Copp and Dr. Everett P. Flood, to whom we express our sincere thanks.

The method of analysis followed was the Ludwig-Salkowski—the one now regarded as the best.

In all, twenty-nine specimens of twenty-four hours' urine were analyzed, coming from two patients. The first patient had five seizures during the period (three months) corresponding to the analyses; the second patient had two seizures during one month (October) and one seizure during another month (April). The results, as may be seen by examination of the accompanying table, cannot be said to bear out Kräinsky's categorical statements, either as regards the low excretion before the attacks or the high excretion after them.

In two instances the amount was very low, both on the seizure day and the day following, perhaps corresponding with the patient's presumably reduced state, or, indirectly, to a diminished ingestion of food. If there is any general conclusion to be drawn from the figures it is that the uric acid excretion of both patients was lower than that usually seen.

A reliable determination of the conditions of uric acid excretion taking place literally just before epileptic attacks must always be attended with difficulty, not so much because it is hard to anticipate the seizure as because the amount of excretion varies considerably for the different parts of the day and with the varying character of the food.

Patient.	Date.	Seizure.	Amount of urine.	Uric acid by first analysis.	Uric acid by control analysis.	Average.	Amount of uric acid in 24 hrs.
* ¹ Case one	Oct. 22, 1899	Before	1370 c.c.	0.0641	0.0620	0.063	0.431
* " "	" 23, "	"	2810 "	0.0809	0.0288	0.029	0.419
* " "	" 24, "	Seizure	520 "	0.0618	0.0560	0.059	0.153
* " "	" 25, "	None	1670 "	0.0159	0.0121	0.014	0.116
* " "	Nov. 26, "	Seizure	2100 "	0.0813	0.0272	0.0293	0.307
* " "	" 27, "	None	1710 "	0.0582	0.0500	0.0516	0.441
* " "	" 28, "	"	530 "	0.1408	0.0270	0.0339	0.355
* " "	Dec. 2, "	"	1260 "	0.0992	0.0904	0.0948	0.597
* " "	" 3, "	"	2260 "	0.0432	0.0428	0.0430	0.486
* " "	" 4, "	"	1890 "	0.0882	0.0372	0.0377	0.282
* " "	" 5, "	Seizure	1100 "	0.0770	0.0740	0.0755	0.415
* " "	" 6, "	None	1870 "	0.0562	0.0527	0.0544	0.509
* " "	" 7, "	"	1290 "	0.0900	0.0820	0.0860	0.554
" "	" 18, "	Seizure	1170 "	0.015	0.011	0.013	0.120
" "	" 19, "	"	870 "	0.014	0.012	0.013	0.087
" "	" 20, "	None	1500 "	0.020 + (0.2016 g. precip. out) = 0.426			
* Case two	Oct. 21, "	"	1260 "	0.0813	0.0795	0.0804	0.506
* " "	" 22, "	Seizure	900 "	0.1314	.....	0.1314	0.591
* " "	" 23, "	None	2120 "	0.0514	0.0540	0.0527	0.558
* " "	" 24, "	Seizure	1640 "	0.0749	0.0481	0.0615	0.504
* " "	" 25, "	None	680 "	0.1690	0.1804	0.1747	0.593
* " "	" 26, "	"	1260 "	0.0526	0.0446	0.0486	0.306
" "	Apr. 24, 1900	"	1275 "	0.0550	.....	0.0550	0.522
" "	" 25, "	"	1600 "	0.026	0.025	0.0255	0.30
" "	" 26, "	"	1110 "	0.037	0.033	0.035	0.28
" "	" 27, "	"	1060 "	0.030	0.029	0.0295	0.23
" "	" 28, "	"	1135 "	0.017	0.010	0.013	0.10
" "	" 29, "	Seizure	1150 "	0.022	0.019	0.025	0.17
" "	" 30, "	None	540 "	0.0081	0.0080	0.008	0.032

It seemed to us that the best way to begin, at all events, would be to examine a continuous series of twenty-four hour specimens, to ascertain whether uric acid excretion was different on seizure days from that on free days. We did, however, in one or more instances, examine anti-paroxysmal specimens, but without finding such differences as encouraged to further pursuit of this method.

¹ All the analyses marked in the table by an asterisk (*) were done by the older method of analysis as given in Hoppe-Seyler's Handbuch der Chemischen Analyse, Berlin, 1893, p. 358.

All the analyses not so marked were done by the same method, with a slight modification, as given in Salkowski's Practicum der Physiol. u. Path. Chemie, 1893, p. 239.

MINOR FORMS OF CARDIAC DILATATION.¹

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CARDIAC dilatation in a pronounced degree, due either to organic valvular disease or to obvious myocarditis—acute or chronic—is no doubt recognized and properly treated by the average good and careful clinician. This affection in its minor degree is frequently confounded with some other ailment, or when recognized not given its due importance, and hence ignored so far as active, direct treatment is concerned. Cardiac dilatation when at all advanced may usually be recognized, as we know, by the usual methods of physical examination.

Percussion shows increased cardiac dulness, especially in a lateral direction; palpation finds the heart impulse lessened in force, more diffuse, and the locality of the apex-beat often somewhat changed, and not always readily determined. Inspection corroborates these findings more or less well. The use of the stethoscope in addition reveals feeble, irregular heart sounds. The two sounds of the heart resemble one another more nearly—the long pause is shortened. We may or may not have a soft blowing murmur at the apex of the heart, and this murmur, usually systolic, may also be diastolic. The pulse is rapid, irregular, depressible, as a rule. It may be very infrequent. Dyspnoea, palpitations, and occasional præcordial pain as symptoms of cardiac dilatation are not unusual. Now and then we have in most pronounced cases blueness of lips and fingers, obstructed general venous circulation, and œdema of the lower limbs. The foregoing is a brief picture of cardiac dilatation in its advanced stage.

As I meet it in minor forms in my daily rounds of practice it does not appear precisely after this manner, and I have been often misled as to its presence and significance. One very ordinary type is that of the anæmic girl just past the age of puberty. She suffers often from too profuse menstruation, constipated bowels, and gaseous eructations from the stomach; she has little or no appetite, and is constantly tired and nervous. The heart fluttering and irregularity (subjective) which go with these symptoms we recognize, and yet how seldom do we consider the heart action in these instances as being indicative of organic change, which must be treated properly and effectually if we are to obtain good, curative results. Such cases require iron and oxygen, rest and massage, proper diet and restricted hours of mental effort. They also require, still more, and in the beginning of treatment it is absolutely essential, small, repeated doses of digitalis and nux vomica until their hearts respond forcibly or at least with power sufficient to enable us to make

¹ Read before the Association of American Physicians, Washington, D. C., May 1, 1900.

satisfactory use of the other means to restore bodily activity. How shall we recognize such cases? Oftentimes with much difficulty, unless we appreciate rather obscure clinical facts. There is no diffuse or weakened cardiac impulse. On the contrary, the heart apex beats in the fifth interspace below and inside the nipple line. It may be of good force and not at all irregular. Abnormal sounds are not always present. There may not be any marked accentuation of the second sound. As a rule, however, the action of the heart is more frequent than normal, and the first sound is exaggerated, seemingly irritable. Give these patients for a week or two digitalis and strychnine in moderate doses, and follow them with a prolonged course of iron, and we get our best results. Act differently, and we are disappointed in our effort, time and again, to relieve symptoms and improve the general health.

One of the proofs, as I believe, which show the correctness of my diagnosis is that frequently in these cases the urine is light colored, of low specific gravity, containing neither albumin nor casts, and it may or may not be in sufficient quantity. Rest in bed will change this urine so far as color, density, quantity, and the elimination of urinary solids are concerned. It will also be effected and more rapidly sometimes with rest, sometimes without, by the use of suitable cardiac tonics in very moderate doses.

I know such a condition is often attributed to impairment of the nervous tone, or perhaps to hysteria. So, indeed, it is at times; but behind this frequently is the loss of a certain amount of cardiac muscular power. The cavities of the heart are doubtless slightly enlarged, and particularly that of the left ventricle, and the walls thinned. There is no hypertrophy, and why? Simply because there is not sufficient vital energy to produce it. The power of the heart can only be increased in one of two ways: by general corroborant treatment, or, at first, by suitable cardiac stimulation, and subsequently followed by the second. The latter plan is the speedier and better one, as I believe.

Formerly in some of these cases I was at times in reasonable doubt for a while as to whether I had to do with beginning renal changes of interstitial nephritis. The age of the patient, the anæmic state, and the rapid effects of judicious treatment settle all reasonable doubts very soon at the present time in the great majority of cases. In these instances is the heart muscle structurally affected? Is there granular or other degeneration of cardiac fibres? I do not believe so, at least in the great number of examples, in view of the success of treatment after several weeks or months. In other instances, where there little or no favorable response to rational medication, change of air and nursing, and where the examination of the blood by an expert shows signs that indicate a formidable anæmia feigning the pernicious form, I am convinced that we have to do with parenchymatous changes of the myocardium of more or less grave import.

Is there any method by which we can demonstrate these changes to the skeptical during life? Certainly not. All we can do is to reason from analogy and our pathological findings in more serious states which go on to a fatal termination. Fortunately, the overworked shopgirl, or the tired-out society young lady, when she gets the care required, ultimately, and as a rule, gets fairly well. I have no doubt in my own mind that in many instances perfected development or full growth of the body reached from the twentieth to the twenty-fifth year explains the happy termination of some cases. In other words, these cases in a measure may be self-limited. To the unconvinced listener who would call such cases merely functional, I would answer: if they are then the words of Sir Andrew Clark apropos of another topic seem to be singularly suggestive and true:

“We are,” writes Clark, “so much concerned with anatomical changes; we have given so much time to their evolutions, differentiations, and relations; we are so much dominated by the idea that in dealing with them we are dealing with disease in itself, that we have overlooked the fundamental truth that these anatomical changes are but secondary and sometimes the least important expressions or manifestations of states which underly them. It is to these dynamic states that our thoughts and inquiries should be turned; they precede, underlie, and originate structural changes; they determine their character, course, and issues; in them is the secret of disease, and, if our control of it is ever to become greater and better, it is upon them that our experiments must be made.”¹

Another form to which I would direct attention is that of the somewhat obese woman—married or unmarried—between forty and fifty years of age. Not infrequently these women have a marked rheumatic tendency. Not infrequently their urine on cooling deposits an excess of urates or uric acid. They often have slight attacks of bronchitis, ambulatory neuralgic pains, localized dry pleurisy. When in their usual health they can take moderate exercise without great distress. So soon as they have any acute ailment or depletion they suffer from marked difficulty of breathing, a gone feeling at the epigastrium, and an inward sense of suffocation, as they express it. Usually their cardiac action is feeble, rapid, and slightly irregular under these circumstances. Physical examination may or may not reveal at this time a soft, blowing murmur—systolic as a rule, often heard with greatest intensity in the mitral area, but also heard at times in the left intercostal spaces above the nipple or at the lower end of the sternum. The blood may or may not show a moderate degree of anæmia. During and after their menstrual epochs these patients are often at their worst, and whenever their

¹ British Medical Journal, August 16, 1884, p. 312.

flow is abundant their condition inspires great solicitude. They do not always have fever when they have their slight bronchitic or pleuritic attacks. At other times the temperature rapidly goes to 102° or even higher, and areas of local pulmonary congestion are accurately made out. Such cases are amenable to judicious treatment, and in the course of ten days or two weeks very great temporary improvement will take place. I usually give very small repeated doses of *nux vomica* and *strophanthus* in the beginning of these attacks. I insist upon rest in bed and frequent small quantities of liquid or easily digested food. Where there are cough and local signs of dry pleuritis a small fly-blister, though painful, is a sovereign remedy. Of course, the menstrual flow when excessive should be controlled with ergot or hot douches.

In some of these cases where there is also well-marked anæmia there is present at times and in a more or less continuous manner a small amount of albumin in the urine. The clinical examination of the urine is such that I have known patients of this sort to be told that they were suffering from nephritis, and it was essential for them to live during a long period upon a milk diet, and to reside in an equable, dry, and relatively mild climate. In these cases the albumin would at times disappear, but fatigue, indiscretions of food, and temporary excitement would apparently bring back the albuminuria. I have no doubt the kidneys were affected with chronic congestion. I am also very confident that the hyperæmia was passive rather than active, and was, in reality and mainly under the dependence of a weak heart, quite insufficient in its action to keep up a proper vascular tension in the renal arteries. Here, again, judicious cardiac treatment was essential at first. With the *digitalis* or *strophanthus*, however, I usually combine a small quantity of nitroglycerin, as I deem it very important to dilate the peripheral circulation and thus lessen the work of the heart necessary to become effective.

There is another type of woman, and she is usually thin and nervous about the time of the climacteric or past it. The menstrual flow if it still exists is slight. These patients may not be anæmic to any appreciable extent. They have frequently very imperfect digestive assimilation. They may have some dilatation of the stomach, and are frequently nauseated and unable to take even the simplest forms of food for a time without causing great and rapid gaseous distention, not only of the stomach but also of the bowels. The liver is inactive and the bowels are torpid. We can give few medicines by the mouth except stomachics and carminatives without making their condition worse. Although their heart is extremely feeble, so much so at times in fact that we dread almost to move or raise them to make a proper exploration of the chest, yet if we so much as try to use any medication by the mouth to strengthen heart action we shall almost surely bring on worse

distress and perhaps excessive nausea and repeated vomiting. I have been obliged to treat such a patient for days at a time with digitalin and strychnine hypodermatically, while inhalations of oxygen were frequently administered. Rectal alimentation with panopepton, peptonized milk, egg, brandy, and a little opium at times took the place almost entirely of feeding by the mouth for several days. Where the repeated use of the hypodermatic syringe set up local irritation I was obliged to incorporate my cardiac stimulants with very small rectal enemata of water. Finally, after weeks of anxiety and constant nursing and unremitting attention, these women slowly regained their health and strength, and the heart became sufficiently strong to satisfy ordinary demands made upon it when the patient went about in a very limited measure. The urine never, upon repeated examinations, showed either albumin or sugar, but did show low specific gravity, deficient elimination of urea, and perhaps a few hyaline or granular casts. I could not positively affirm any general arteriofibrosis. I could and did strongly suspect its presence. The heart gave all the evidences of slight dilatation of the ventricular cavities, but at no time was there any manifest hypertrophy. In some patients there was rarely any cardiac murmur, and all I could detect, as a rule, was great feebleness of heart action without irregularity or intermissions. I have no doubt, for my part, that if these hearts were examined post-mortem they would show few or no changes other than those which follow. They would be soft and flabby. They would not retain their rounded, globular form, but would flatten on the table through partial collapse of the walls. There would be no valvular changes. The orifices might be slightly dilated. There would be, as stated already, slight enlargement of the cavities and thinning of the muscular walls. The color of the heart muscle would approximate that of the faded leaf; perhaps, usually it would only be relatively pale and bloodless. The cavities would contain small, imperfectly-formed post-mortem clots or liquid blood. Under the microscope we should find the striæ here and there imperfectly marked. There would possibly be some well-marked granular degeneration at times, and only very rarely the evidence of fatty degeneration. If the latter existed it would more likely be in patches in the capillary muscles, the septum, or the ventricular walls than generally diffused.

Unfortunately, these are at best clinical impressions rather than well-ascertained facts. And why? Simply because post-mortem examinations of these cases are not made. The patients do not die, in my experience, at least outside of hospitals. In hospitals, when they die, they have more advanced and graver phenomena of a similar condition; and then it is we can surely and positively affirm what our findings are.

In many instances I have had a report from the pathologist which in its main features was not unlike what I have attempted to describe.

In this connection I would refer to a paper of Dr. Danforth, of extreme interest to me, read at the last meeting of this Association, on "Clinical Forms of the Uric-acid Diathesis." It seems to me that some of Dr. Danforth's cases may have been mainly instances of cardiac dilatation in which the renal manifestations were merely a resultant of a weak, feeble heart action. At all events, I have portrayed the other side of a clinical picture frequently encountered by myself. I do not wish to convey the impression that I have made a new discovery—such cases as mine are met with by all of you. They are also described more or less perfectly in almost every text-book of cardiac disorders of the last fifty years. Still, I am free to confess that I do not know precisely where you will find the clinical picture I have endeavored to delineate in quite the same terms.

I may be asked whether I do not find these cases also among men. Perhaps I do, but I do not recall them in such a vivid manner as to be able to portray them. The laboring man, even though he may never suffer from actual valvular disease, will undoubtedly have at times marked cardiac dilatation. But usually there is more or less hypertrophy combined with it, and, even though the heart has become very incompetent through structural weakness, there will be such considerable enlargement that we feel confident that the autopsy will show more or less thickening of heart walls. The same is true of old valvular disease accompanied with cardiac enlargement. It is equally true, as a rule, where the history shows that there has been a persistent and excessive alcoholic habit. This is true also, although in less degree, of the business or professional man affected with heart disease.

Extreme cases of heart dilatation and no hypertrophy are also met with among men; but the minor degrees, those to which I have referred and tried to describe, are usually found among women. The intense heart failure, coming on rapidly, almost suddenly at times among men, and unquestionably due to very great cardiac dilatation, against which the heart is almost powerless to react, is sometimes seen after great excesses. These cases, as we all know, may be rapidly or suddenly fatal, despite our most active means of resuscitation. Among these cases, however, are unquestionably some in which the physical signs of cardiac dilatation are impossible to determine accurately. I can, therefore, well understand that their existence should be denied. In place of such a diagnosis I can but substitute one of loss of nerve-power, either in the intracardiac ganglia or in the trunks of the vagi. To admit this would be perhaps also to acknowledge that the heart muscle was intact and the cavities of normal dimensions. Such a belief would be strengthened by those instances in which certain cardiac tonics, and especially digitalis, are of little apparent value, perhaps, indeed, directly injurious,

and rest in bed and suitable liquid diet with alcoholic stimulants appear to be most useful.

Again, there are instances in which there is certainly no pronounced structural kidney change, where we watch closely the sequence of clinical phenomena. This is renal inadequacy only. The secretion of healthy urine, viz., of normal color, density, in sufficient quantity and without abnormal constituents, after a few days or weeks of rest, and when the patient is given easily assimilable food, returns, and our temporary fears are allayed. In some cases I recognize a possible spasmodic condition of the peripheral vessels and especially of the kidneys. We have intimation of this by high pulse tension at times and the rapid good effects of repeated small doses of nitroglycerin. Occasionally I have seen cases in which the heart action was very feeble, without any accentuation of the aortic second sound, and where the radial pulse itself had no increased tension, and yet nitroglycerin was of undoubted service, for after its use the heart's action was notably improved, and the secretion of urine, from being almost colorless and even small in quantity, took on its normal appearance and character. No doubt the nitroglycerin acted as a direct heart tonic to the cardiac muscle itself; no doubt, also, it dilated the small vessels of the kidney, breaking up any spasmodic condition that existed, and thus was of very great benefit to the patient. At all events, I have certainly seen nervousness, marked twitching of the muscles, apathy and somnolence—all symptoms, as I believe, indicating more or less so-called uræmic poisoning—disappear and the patient progressively improve until fairly good health and strength were established. Examples of this kind are not uncommon, I believe, as a resultant of what has appeared to be a gripal attack.

Through a contribution to the London *Lancet* in October, 1899, by A. E. Sansom, I am of the opinion that he, also, has seen cases not dissimilar. Cohnheim and Leyden have intimated that occasionally the underlying cause of uræmic symptoms is found in cardiac insufficiency. Hence, the blood stagnates in the renal vessels. Clinical observations on contracted kidneys support this view, as does the use of cardiac stimulants for the relief of their manifestations.

From the point of view of prognosis the character of the pulse is often very important. When it is relatively weak and perhaps irregular the outlook becomes serious. Sir William Broadbent has pointed out the gravity of a pulse of low tension when accompanied with symptoms indicating possible cirrhosis of the kidney. I have frequently had occasion to make a similar observation. No doubt many of these cases, however, merely enter into the category of what Sir Andrew Clark has described as "renal inadequacy" accompanied with some degree of cardiac dilatation. These are a class of cases in which, although the kidney

presented no alteration of structure, it was unable to produce a perfectly healthy urine. In these cases the urine is low in density and deficient in solid constituents, principally in urea and its congeners.¹

I might lengthen this paper considerably. I prefer not to do so, as I very much desire a discussion as to its value and truth.

ENDOTHELIOMA OF THE SKIN DEVELOPING IN THE SCAR-TISSUE OF LUPUS VULGARIS; ANGIOSARCOMA OF THE SKIN.²

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CLINICAL and pathological investigations of apparently insignificant affections of the skin often yield results which have a more general application than to the special department of medicine directly concerned.

Our knowledge of malignant diseases in general has been enhanced by a study of the pre-epitheliomatous conditions of the skin, which are met with in xeroderma pigmentosum, Paget's disease of the nipple, pigmented and other moles, and in the effects of chronic irritation in stimulating epithelium to develop in the aberrant fashion met with in malignant growths of this tissue. The tumors which originate from the mesodermic structures form an even more interesting group of new growths than those which result from the proliferation of epithelium. Certain of these, as the endotheliomas, so closely resemble the epitheliomas that it is sometimes a difficult matter to differentiate them histologically; others, as the Kaposi type of multiple sarcoma, appear simultaneously on the extremities apparently independent of a parent tumor. We find again single tumors presenting all the minute structure of the angiosarcoma of Kaposi, which remain localized, do not recur after removal, and are apparently benign growths. Our knowledge of the etiological factors concerned in these new growths is, unfortunately, so meagre that no good reasons can be given for the differences met with in the clinical behavior of growths apparently alike in their structure. In certain of the infectious granulomas which are usually multiple in their manifestations we occasionally meet with one which, unable to overcome the resisting power of the tissues, or because of the slight virulence of the infectious agent, remains as a localized growth. We may invoke a similar explanation to account for the like variations in the malignancy of the connective tissue class of tumors.

¹ Albuminuria and Bright's Disease, by M. Tirard, London, 1899, p. 16.

² Read before the twenty-fourth annual meeting of the American Dermatological Association, Washington, D. C., May 2, 1900.

The case which forms the subject of the following brief report is interesting because of the histological structure of the growth rather than from any pronounced clinical feature of the affection.

The patient, an unmarried woman, aged forty-six years, had been afflicted for fifteen years with a chronic skin disease of the forearm. She had been under the care of several dermatologists who had made various diagnoses of the affection. Numerous applications and minor surgical procedures had been resorted to with only temporary relief.

When she came under my care I found a fairly typical patch of lupus vulgaris on the right forearm. The patch was about the size of a silver half-dollar, and was made up of scar-tissue and numerous out-lying lupus nodules, the size of a pin's head and larger. A small, hard nodule, somewhat larger than a pea, was present on one side of the patch, which I looked upon in the beginning as a hypertrophied scar, the result of previous caustic applications. The lupus nodules were scraped away with the sharp curette, and chloride of zinc applied thereafter. After several attempts of this kind the lupus tissue was entirely destroyed. The nodule, to which reference has just been made, showed an increase in size, and an attempt was made to destroy it by electrolysis. Such efforts, however, only resulted in a rapid increase in its growth, and I excised it. The wound rapidly healed, but was followed by a false keloid along the line of excision, closely resembling the original growth.

As a microscopical examination of the tumor had revealed its malignant nature, I advised the patient to submit to another operation. The thickened scar was accordingly removed by an excision extending for some distance around the affected tissue. The growth removed by the second operation was found on microscopical examination free from malignancy, being composed entirely of young connective tissue.

The excised tissue was fixed in a saturated solution of mercuric chloride, embedded in paraffin and cut in series. These sections were stained with hæmatoxylin, methylene-blue and eosin, acid orcein and thionin, and by other methods. The derma throughout its entire thickness was found to be the seat of large- and small-celled masses, irregularly rounded, oval, and elongated in shape. (Fig. 1.)

The groups of cells were separated by a network of fine connective tissue fibres containing small, brightly staining, mononucleated cells; these small round cells were densely packed together about the advancing margins of the new growth. The epidermis covering the tumor was much thinned, the papillæ were obliterated, the prickle cell layer being made up of half a dozen layers of cells over which a few layers of horny cells were seen. The atrophic condition of the epidermis was evidently owing to the growth and pressure of the underlying tumor. The cell masses in the derma, most of which represented transverse sections of proliferating cells, were found in many instances arranged about central cavities containing red and white blood-cells and collections of fibrin. (Fig. 2.) In certain of these cavities a distinct lining membrane of thin, elongated cells could be made out. In others the cavities communicated directly with the surrounding cells of the new growth.

The presence of these central spaces gave to the histological picture its characteristic features, and differentiated it from an epithelioma which it so closely resembled. In none of the serial sections was there any suggestion of a connection between the growing cell masses and the epidermis or the glandular appendages.

In preparations stained with acid orcein and a nuclear dye, the absence of elastic tissue in the superficial and middle portions of the derma is well shown. The elastic fibres are, however, seen at the margins of the growing tumor and in the deeper portions of the derma.

The absence of elastic fibres may be observed in new formations in the skin, and serve to differentiate them from inflammatory and other infiltrations of this organ where such fibres can be demonstrated. Under high magnification the perivascular cells which make up the new growth are readily stained with any of the nuclear dyes. They are seen

FIG. 2.

tion of the tumor under low power, showing the ma.

a, ocular 2. A transverse section of one of the development of the tumor from the capillaries. red and white blood-corpuscles.

lei, densely packed together, rich in nuclear figures. (Fig. 3.) The proto- be demonstrated by the use of a basic r other dyes of this character. In he rapidly growing cells, the nuclei causes them to simulate spindle cells. cells is often observed in the rodent-

f the cells alone, as well as from the the masses in the connective tissue differentiate the growth in question The grouping of the cells about the section with the endothelial lining of ace the origin of the growth to these ertainty from the epitheliomas start- hair follicles, or the glandular ap- growth of the kind with lupus is, as

far as I have been able to learn, a unique observation. In spite of the malignant appearance of the cells, as shown by their numerous mitoses, we are justified, in view of the relatively benign course of these tumors in other organs as well as in the skin, in offering a better prognosis as to possible recurrence than in the epitheliomas which are met with in conjunction with lupus.

FIG. 3.

Spencer quarter-inch. Zeiss projection, ocular 2. Reduced about one-half. A similar condition to that shown in Fig. 2, but more highly magnified.

A certain amount of practical as well as scientific interest is therefore attached to a study of the case in question.

The majority of the text-books on pathological anatomy, while admitting the close resemblance of the endotheliomas to the epitheliomas, are disposed to classify them with the sarcoma group on account of their supposed origin from the connective tissue structures. Certain pathologists, however, claim that endothelium is derived from the same embryological layer as the epithelium, while others maintain that it originates from connective tissue cells.

It may be well, as has been suggested, to make a separate classification of these tumors in view of their peculiar structure and clinical course, which in some of the organs, as the skin, is rather more benign than either the carcinomas or the sarcomas. The tumors of this group which have been most carefully studied are the endotheliomas of the serous cavities and the dura mater. In the pleura they are met with as small, whitish, multiple nodules, in which the lining cells of this membrane or the lymph-vessel endothelium are primarily involved. They give rise to metastases in the bronchial glands and lungs.

In the skin there are but few recorded cases of these new growths in which their clinical as well as their pathological features have been care-

fully studied. Modern text-books on dermatology make little or no reference to their possible occurrence.

In a recent article by Spiegler,¹ which is illustrated with a number of colored and other lithographs, the author describes three cases of his own, and three other cases which he has collected from literature, in which the scalp was the seat of numerous bean- to orange-sized tumors. A remarkable similarity is shown in all the cases which are illustrated in the author's article. In addition to the great mass of tumors on the scalp small pea-sized growths were noticed in some of the cases, over the face, neck, and the upper parts of the chest and back. The clinical course of the tumors was relatively benign, as shown in their long duration, the first case reported having lasted for more than forty years.

In Ancell's case, which is reproduced from Hutchinson's *Archives of Surgery*, 1892, the patient had been afflicted with the tumors for nearly forty years; she died from metastatic involvement of the liver, peritoneum, omentum, and mesentery.

In this case three generations were afflicted in the same manner with this unusual form of new growth, and in two of Spiegler's cases father and daughter showed almost identical conditions.

The careful histological examination which Spiegler made in all of his cases revealed in one of them only a connection between the cell masses of which the tumors were made up and the capillaries. He concludes, however, in the absence of other sources of the abnormal cell growth and from the clinical and pathological similarity that they are all endotheliomas.

It may be well to refer briefly to the association of the malignant growth in my case with the long-standing lupus vulgaris. In the latter affection epitheliomas occur with sufficient frequency to indicate more than an incidental relationship. They are apt to assume fungating forms, prove rebellious to treatment, and pursue a more rapid course than when independent of such a connection.

In both syphilis and lupus the development of cancer seems to be favored by the changes which take place in the epidermis as well as those which occur in the true skin and underlying tissues. The chronic changes which these affections produce may stimulate the epidermis to proliferate while lessening the normal resisting power of the connective tissue.

The advocates of the parasitic theory of cancer look upon all association of the malignant disease with pre-existing lesions as accidental. The changes in syphilis, lupus, scar-tissue, etc., merely furnish a nidus or favorable soil on which the superadded infection more readily develops. The parasitic theory of cancer which, from the stand-point

¹ Ueber Endotheliome der Haut. Arch. für Derm. und Syph., 1899, B. 1. S. 163.

of the clinician has much to be said in its favor, is not accepted by the majority of pathologists. The old hypothesis of Thiersch, which supposed that the wasting of the connective tissue in older individuals favored the down-growth of the surface epidermis by removing the barrier normally existing between the two structures, has lately been revived in a modified form under the "disturbance of balance" theory. This hypothesis, applied to the association of cancer and lupus or cancer and other chronic changes in the skin, affords an explanation which may be accepted until a better one is offered.

FIG. 4.

FIG. 5.

FIG. 4. Spencer half-inch. Zeiss projection, ocular 2. Tumor of abdomen removed from a twelve-year-old boy. Newly-formed connective tissue from the adventitia of the papillary and subpapillary vessels.

FIG. 5. Spencer quarter-inch. Zeiss projection, ocular 4. An enlarged view of a portion of FIG. 4.

The Kaposi type of sarcoma—the so-called idiopathic multiple pigmented sarcoma—is one of the best illustrations of a true angiosarcoma—i. e., one in which the growth is made up on connective tissue elements, which apparently originate from the adventitia of the vessels.

The development of new bloodvessels is also a marked feature of the affection. In fact, the angiomatous element of the growths often predominates to such an extent that it is sometimes difficult to determine whether or not we have to deal with a malignant growth.

The clinical course which some of these cases pursue would seem to indicate that they are primarily angiomas, but later take on a malignant character. Histologically, the line which divides the angiomas from the angiosarcomas is not sharply drawn, as in both we have newly developed connective tissues and bloodvessels, their clinical behavior

at times being required to differentiate the one from the other. It is not difficult to understand how the unstable embryonic tissue of the angioma may at times develop a malignant growth, just as the pigmented mole reproduces its type of tissue in the pigmented carcinoma.

I have excised from the scalp of a woman, aged forty years, and a ten-year-old girl, small, brownish-red growths larger than a good-sized pea. The small tumors were almost exactly alike.

No recurrence took place as far as I have been able to determine. Under the microscope these growths were almost identical, being made up of newly developed connective tissue surrounding dilated and recently developed vessels. It would be impossible, pathologically, to distinguish the sections in these cases from those of a generalized angiosarcoma of Kaposi.

The localized variety of angiosarcoma is illustrated in the photomicrographs (Figs. 4 and 5) which were made from sections of a small warty growth from the abdomen, removed from a twelve-year-old boy.

There was considerable epithelial hypertrophy which gave the warty character to the growth. The history given by the mother of the boy was that a wart had been present for some time, but lately had been rapidly growing.

In portions of the tumor just beneath the epidermis the tissue closely resembled a benign angioma, the chief part of the growth, however, was a typical angiosarcoma in which the perivascular connective tissue cells showed numerous mitoses and were readily and brilliantly stained with the ordinary nuclear dyes. After the growth was removed the patient failed to return to the clinic, so that I am ignorant of the further course of the growth.

A COMPARATIVE STUDY OF DIGITALIS AND ITS DERIVATIVES.

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I. Digitalinum Germanicum and Digitoxin.

INTRODUCTION. The conflicting results obtained by investigators of the derivatives of digitalis, the differences of opinion which exist among clinicians as to their therapeutic value, and the importance of determining whether any of them represent the activity of digitalis, have led the writers to undertake this research. We believe that we have found certain definite causes for the diversity of results, and that we shall be

able in this paper to make some of the apparently conflicting opinions agree as to the action of these substances.

The original purpose of this paper was merely to determine the therapeutic value of digitalin, but our studies revealed so much ignorance and confusion concerning the action of the drugs belonging to the digitalis group that it seemed almost impossible to limit our investigations so narrowly. In this paper we desire to call attention to some experiments on the value of German digitalin and digitoxin compared to the tincture of digitalis, at the same time pointing out some facts concerning their effects on the circulation. In a future paper we hope to publish the results of investigation of some of the other principles of digitalis.

The digitalin and digitoxin used in this study were furnished to us by Merck & Co., and our thanks are due to them for their liberality. The tincture was the U. S. P. tincture.

It is necessary, before taking up the subject proper of this research, to consider briefly the relations of the so-called active principles of digitalis to each other. The recognized proximate principles found in digitalis are: digitalin, digitaleïn, digitonin, digitin, and digitoxin. The first four are glucosides. Digitoxin, according to Schmiedeberg,¹ is not a glucoside, but by other authors is stated to yield glucose.

All of these—except digitoxin, which belongs to the saponin group, and digitin, which is inert—have a very similar influence on the circulation.

As to the three active products mentioned, unfortunately much confusion exists. For example, the name digitalin has been applied to an amorphous product which is soluble in water, to another substance which exists in porous masses or fine scales and is insoluble in water but soluble in alcohol, and to a third body which is crystallizable and soluble in alcohol. The most important of the substances offered by various investigators as representing the activity of digitalis are: digitalinum Germanicum, digitalin cristallisée of Nativelle, digitalin of Homolle and Quevenne, digitalin of Kiliani, digitaleïn and digitoxin of Schmiedeberg.

It seems probable from the literature that the digitalin of Homolle and Quevenne is an impure form of digitalin cristallisée, which seems to be identical with digitoxin, and that digitalinum verum of Kiliani is the digitaleïn of Schmiedeberg. According to Schmiedeberg, digitalinum Germanicum is a mixture consisting largely of digitaleïn. It has also been stated that digitalinum Germanicum contains digitoxin. This statement seems to us extremely improbable, as digitoxin is almost entirely insoluble in water, while German digitalin dissolves readily in water. If digitoxin is present in digitalin as such we do not see how it is possible for the mixture to dissolve completely in water unless there be present some unknown solvent in digitalin.

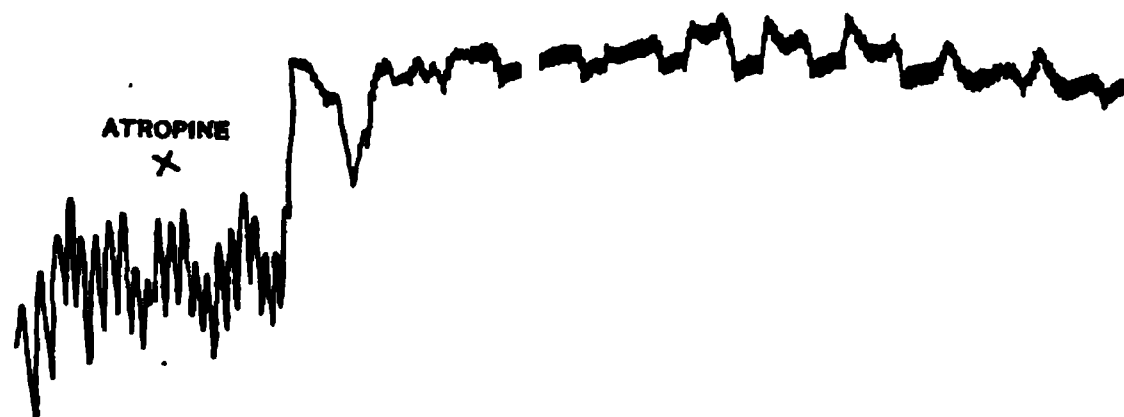
A plausible explanation of the discrepancies in the results of chemical investigations is that these substances, known to undergo chemical changes with comparative ease, may be altered by the manipulations required to separate them.

Viewed from the stand-point of its physiological action, we believe the digitalinum Germanicum furnished by Merck to be a uniform product and stable in its composition. In regard to its stability, we may say here that we obtained identical results with some which had been in the laboratory more than two years and that sent to us direct from the manufacturer in sealed containers.

The most important practical question is whether any of these substances represent the therapeutic activity of digitalis. It seems useless to continue with the apparently endless discussion as to their chemical relations.

GENERAL ACTION ON THE CIRCULATION. Our studies of the blood-pressure were mostly made on dogs, the drugs being given intravenously. The results obtained were so uniform that it will only be necessary to give the details of a few experiments which may be considered as representing very fairly the general results of our work. In addition to this a number of tracings and tables have been appended, and from these the reader may draw his own conclusions.

FIG. 1.



Animal has received 0.01 gm. digitoxin. + = Injection of 0.02 gm. atropine sulph.
Showing the abolition of the effect of digitoxin on the pulse rate, and the accompanying sudden rise of pressure.

Tincture of Digitalis administered to a dog weighing 16.8 k., in doses of 1 c.c. to 2 c.c. (see Table I.), produced the following results: After 2 c.c. had been given the blood-pressure rose from 136 mm. to 154 mm., and the pulse rate decreased from 210 to 114. After 2 c.c. more the rate was 65. The pulse waves were enormous in size (16 mm.), and the blood-pressure rose to 190 mm. Suddenly, after this condition had per-

sisted for one minute, the pulse rate increased to 228 and the pressure fell to 148 mm. The pulse waves were very small. This condition of rapid pulse continued after further dosage, and the pressure remained about the same. The only change observed was that the pulse became somewhat irregular. After the final dose the heart suddenly ceased beating, and upon rapidly opening the thorax was found in diastole. The right ventricle responded to stimulus, but the left did not.

That the change in the pulse rate was due to vagal influence is shown by Experiment II. (see Fig. 1), in which 0.02 gramme of atropine sulphate caused an immediate increase in the rate of the heart beats from 42 to 198 per minute, with an accompanying rise of pressure. In this experiment as the rate of the pulse increased the size of the individual waves diminished, remaining, however, always larger than the normal. A further injection of 2 c.c. of digitalis caused a fall of pressure to 124 mm., while the rate remained 198. After a final dose of 3 c.c. the heart almost at once ceased beating, and immediately afterward was found in diastole and non-irritable.

Digitalin administered to a dog weighing 8.4 kilos in doses of from 0.02 gramme to 0.4 gramme (see Table III.) caused after a dose of 0.04 grammes a rise of blood-pressure from 114 mm. to 120 mm., and a reduction of rate from 108 to 87. After another dose of 0.02 gramme the rate was 63 and the pressure 140 mm. The pulse waves were large and occasionally dicrotic. After 0.04 gramme more had been given the pressure was 144 mm. and the rate 84. Suddenly, without any preliminary alteration in rate or pressure, the rate rose to 126 and the pressure to 159 mm., the pulse waves becoming much smaller and somewhat irregular. Very shortly after 0.04 more gramme had been given the heart stopped and was found in diastole and did not respond to stimulation. (See Table XI.).

Digitoxin (see Table IX.) given to a dog weighing 9.2 kilos produced, after administering 0.12, a rise of pressure from 146 mm. to 166 mm., and a decrease in rate from 162 to 156. The administration of 0.12 gramme more reduced blood-pressure to 126 mm. and the rate to 90. Another dose of 0.04 reduced the rate to 84, while the pressure rose to 172 mm. Very suddenly and nearly a minute after 0.08 gramme more had been given the pressure rose to 192 and the rate to 186. Forty seconds later the heart suddenly ceased beating, and was found in diastole and responded very feebly to stimulus.

Quite commonly immediately after an injection of digitoxin had been given a marked fall of pressure was observed (see Fig. 2a), but as the drug was given in alcoholic solution and the condition lasted only for a few seconds, we attribute the effect to the presence of the alcohol. It is possible that the irritant action of digitoxin may be partly responsible for this effect.

It will be readily seen from the foregoing statements that there is little if any difference in the general action of these three drugs on the circulation. In each there is seen a rise in the pressure preceding a slowing of the pulse. As a rule the pressure remained high during the period of slow heart-action, although in one experiment with digitalis it fell 6 mm. (see Table II.). After larger doses the rate of the heart became very slow, the pulse waves very large, and during this period

FIG. 2a.

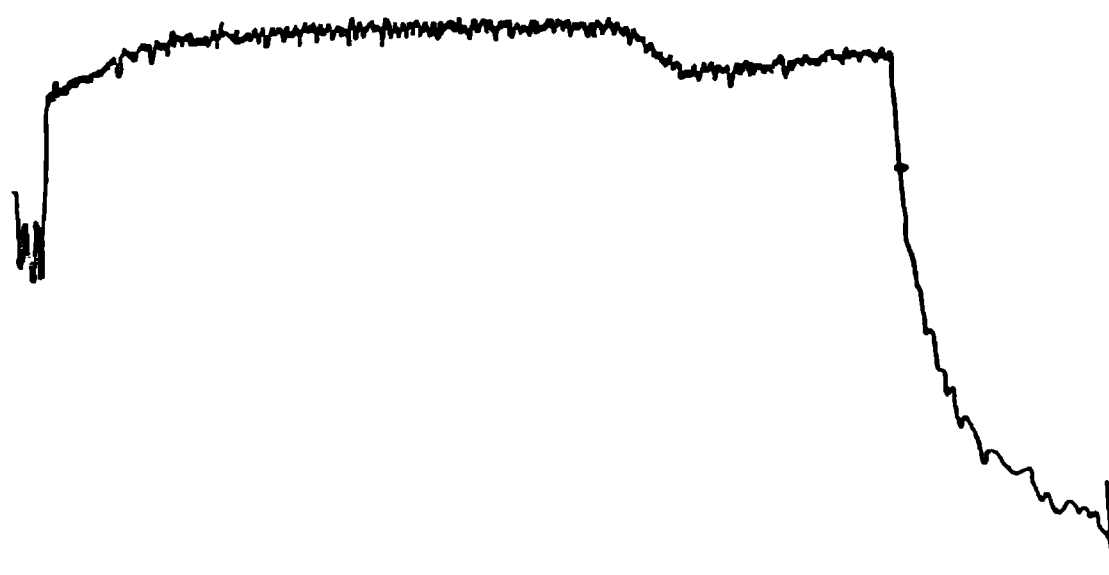


Digitoxin 1 — + = injection of 0.004 gm. digitoxin. Time 5'.

Showing the primary fall of pressure following intravenous injection, due either to the alcohol or perhaps to the irritant action of the drug itself.

FIG. 2b.

1 +



Five minutes later than (a). Has received previous to curve 0.024 gm. digitoxin
1 — + = injection of 0.004 gm. digitoxin.

Showing sudden paralysis of the pneumogastries with rise of pressure, and the sudden heart failure following the fatal injection.

sometimes quite a marked fall of pressure occurred (see Table II.); but, on the other hand, it might be elevated. Pulse waves were sometimes dicrotic (see Fig. 3). With surprising suddenness there followed an enormous increase in the rate of the heart, often with a marked and precipitous rise of pressure (see Table X. and Fig. 2b.). Sometimes, however, for some reason this increase in the rate of the heart did not elevate the pressure, an indication that perhaps the muscle was

weakened coincidently with the pneumogastric. The pulse remained regular for a period, usually later becoming markedly irregular. If more of the drug was administered the heart almost at once ceased to beat, and was found in diastole and practically non-irritable.

FIG. 3.



Time 1 — + — injection of 0.04 gm. digitalin.

Showing the rise of pressure despite slowing of the pulse.

Let us now consider the causes of the effects obtained. The slowing of the heart is undoubtedly due to stimulation of the cardio-inhibitory mechanism, limited chiefly to the peripheral part of this apparatus, as it is not prevented by previous section of the vagi (see Table VIII.), and is prevented or abolished by atropine (see Tables II., VI., and Fig. 4.)

FIG. 4.



Has received 0.025 gm. atropine sulphate. 1 — + — injections of digitalin.

Showing the powerlessness of digitalin to slow the atropinized heart, proof that the slowing is an action on the inhibitory nerves.

In this statement we are supported by Brunton,² H. C. Wood,³ Butler⁴ and Cawarjee⁷ and Cresburg.⁵ Francois Franck states that the slowing of the rate is not due to action on the vagus, but we are unable to see in what manner he has arrived at his conclusions. We feel that our own evidence on this point is quite conclusive. L. Traube⁶ states that, after section of the vagi, soluble digitalin in warm-blooded animals was with rare exceptions incapable of reducing the pulse rate. We

found, to the contrary, that slowing occurred in all our experiments under these conditions. That the slowing is partly due to stimulation of the vagus centre is shown in Table VII., by the increased rate produced by section of the pneumogastrics after slowing had been brought about by digitalin. This view is upheld by Brunton. Boehm¹⁸ states that atropine is powerless to affect the digitalis pulse-rate in frogs; we have not experimented on these animals, but have proven that the statement is not true of the dog.

The rise in blood-pressure is partly due to increased cardiac power, but seems to us more to a constriction of the blood paths. Reference in support of this statement may here be made to H. C. Wood, Biddle, Butler, Hale White,⁹ Ringer and Sainsbury,¹⁰ Brunton, Donaldson and Stevens,¹¹ and others. We cannot agree with the opinion of Ackerman¹² that the rise of pressure is entirely of cardiac origin. Although there is no doubt that the individual beat is much stronger than normal, nevertheless the pulse is so much slowed that we doubt if the heart does a greater amount of work, which conclusion agrees with the results of Donaldson and Stevens and of Klug.⁸

In accord with this we sometimes found a distinct fall in the pressure, doubtless to be explained by the slowing of the pulse, the drug failing for some reason to produce consentaneous increase in the muscle power. At no time did we observe a fall which could be attributed with certainty to depression of the vasomotor mechanism. The sudden rise of pressure with great increase in the pulse rate in the later stages of the poisoning is undoubtedly due to paralysis of the cardio-inhibitory apparatus, as stimulation of the vagus at this time does not produce the usual slowing of pulse-rate (see Table XI.).

As will be shown hereafter, the final sudden cessation of the heart's action is due to a direct paralyzant action on the heart muscle and not to excessive vagus stimulation. It is not prevented by previous paralysis of the inhibitory mechanism by atropine, and, as has been stated above, paralysis of the vagi was uniformly observed in the later stages of the poisoning.

HEART. It is the common custom to study the cardiac effects of drugs on the isolated heart of the frog, and digitalis with its various principles forms no exception to this rule. But the value of such investigations we think is much overestimated, and that it is a mistake to draw too positive conclusions concerning their action on the human economy from such evidence. The contradiction between our results and the common teaching concerning this group of drugs first led us to doubt the reliability of experiments on the batrachian heart, and we think a careful review of the work of various investigators in this field will convince anyone, as it has us, that a method which leads to results so diverse must contain some serious error. There are many theoretical

objections which can be urged against this mode of experimentation, and it is not at all necessary to assume any inherent difference between the muscle-fibre of the heart of warm and cold-blooded animals, although it seems not at all improbable that such difference does exist.

As has been pointed out by Masi,¹⁴ in his studies with digitalin, the temperature of the organ plays an important rôle in its susceptibility and manner of response to poisons. Masi showed that the frog's heart, which ordinarily is arrested in systole by digitalin, would when warmed to 32° C. stop in diastole, and that, conversely, the mouse's heart if cooled remained in systolic spasm after poisoning by the drug. Furthermore, the other conditions under which the isolated frog heart is laboring are so widely different from those of the mammalian heart *in situ* that one might well be surprised that the results should be at all similar. Donaldson and Stevens called attention fifteen years ago to the effect which the high pressure on the venous side of the artificial circulation has on the work of the heart, and by using methods more nearly approaching the normal conditions achieved results quite different from those of previous observers. It is not necessary to go into all the circumstances in detail that can affect the action of drugs on the heart, for no more convincing argument of the faultiness of such methods can be put forward than the widely varying conclusions that different observers have reached.

The one fact on which all investigators seemed agreed is that ordinarily the isolated frog's heart is arrested in systole by the substances under consideration. According to Dybkowsky and Pelican (quoted by Boehm), this is true only of the ventricle, the auricles stopping in diastole. Boehm¹⁵ found that moderate doses of digitalin sometimes caused the frog's heart, when not separated from the central nervous system, to cease beating in diastole from excessive inhibitory stimulation. The systolic spasm has been found by Klug to follow digitoxin also.

Our few experiments on the frog's heart were made with digitalin and digitoxin, to see if any difference in their action from digitalis could be here detected rather than to determine their pharmacological properties. We used the isolated ventricle of the frog's heart with Kroecker's apparatus. For a nutrient fluid a mixture of one part of blood and nine parts of salt solution (0.7 per cent.) was employed.

A digitalin of one-quarter per mille was in all cases sufficient to send the heart into tetanic contraction; indeed, one-eighth per mille was in most cases strong enough. In a heart which was beating spontaneously one-quarter per mille solution produced a condition in which the ventricle relaxed slowly, but as the next contraction began immediately after the relaxation of the previous one there was no distinct slowing of the cardiac rate. At no time could any marked change in the rate be demonstrated, nor was there any increase in the force apparent, the pulse

wave remaining the same height until imperfect diastole lessened it. In the heart stimulated by electricity a very similar state of affairs was observed, with, however, one additional feature of interest. There occurred a stage where, if the impulses were sent at short intervals (60 per minute), the heart would pass into the systolic spasm, but would slowly relax on interruption of the current; if the excitations were separated by a wide enough interval of time the heart would contract and relax perfectly, albeit very slowly. No qualitative difference in the action of digitoxin was detected.

Mammalian Heart. Attention has already been called to the fact that the heart of the warm-blooded animal does not react to these poisons in the same manner as does that of the cold-blooded, and we may now call attention to some of the points of difference. In review of the effects of digitalis on the general circulation we have already mentioned the fact that on opening the chest we invariably have found the heart in diastole. This condition has already been too often described to need any further discussion were it not that Franck denies the truth of it. This investigator affirms that the belief that the heart stops in diastole is due to imperfect methods of observation, and claims to have shown with other methods that it really ceases beating in a state of contraction. He explains the failure of previous experiments to reach the same conclusion by the assertion that this systolic spasm is of very short duration, and that before the chest can be opened the heart has relaxed with fibrillation. After careful study by the method to be described immediately we are unable to agree with Franck, and feel ourselves justified in the statement that in the majority of cases the heart is arrested in diastole. In Experiment III. the termination was such as to allow of a dispute concerning the meaning of the phrase "stop in systole." It is hardly proper in our opinion to speak of a heart having ceased to beat when it remains in the same state of contraction for only a fraction of a second; of course, its last contraction must have brought it into the position of systole, and when systole was done it ceased contracting, but by the same argument it might be shown that the heart always "stops in systole."

Our opinion concerning the death of the heart is based on our cardiac and blood-pressure curves, and on careful studies made to ascertain especially this point by direct observation in the following manner: The jugular vein having been exposed and a canula placed in it, tracheotomy was done and artificial respiration established. The chest was then opened in the median line with especial care to prevent hemorrhage as much as possible; the chest walls were then separated and held apart by chain hooks. The movements of the heart were studied by the eye and finger, and note made both of what we felt and what we saw. As we both saw exactly the same things, and as the phenomena

were of a nature so unmistakable, we think equal or even greater confidence may be placed in it than any graphic method.

In a dog weighing 7 kilos, 5 c.c. of the tincture of digitalis caused the cardiac beats to become slower and more forcible. An additional 5 c.c. brought about only an increase in these effects. After 3 c.c. more the diastolic pauses were very long, and then with most striking suddenness the heart began to beat with extreme rapidity. At first the contractions were regular and moderately full, but later, systolic impulse continually growing relatively stronger than the diastolic, the movements become more and more rapid until finally by imperceptible gradations they were no more than inco-ordinate fibrillary contractions and the organ relaxed, still showing after relaxation in a typical form the "flimmerbewegung" described by Kronecker.¹⁵

It is very easy to conceive that if one were trusting to a graphic method the excessively rapid and minute contractions at the instant when the heart began to fibrillate might easily be overlooked and the heart supposed to be remaining still in systole at this time.

Parallel experiments were done with digitalin and digitoxin, but did not reveal any distinct difference between them and digitalis, and the results are given in tabular form :

EXPERIMENT II.—Digitalin. Dog, weight 6 kilos.

8.51	Thorax opened.
8.52	Heart irregular and weak, 76 per minute.
8.54	Injection 0.10 gm. digitalin.
8.55	Heart stronger and more regular, 72 per minute.
8.56	Heart 212 per minute, systole hard, diastole imperfect.
8.56½	Heart beating excessively rapid.
8.57	Heart fibrillating, stops in diastole, non-irritable.

EXPERIMENT III.—Digitoxin. Dog, weight 4.7 kilos.

9.19	Thorax opened.
9.20	Heart fairly strong, 168 per minute.
9.21	Injection of 0.01 digitoxin.
9.21½	Occasional diastolic pauses.
9.22	Heart shows a tendency to beat in groups of two, 72 beats per minute.
9.23	Heart 52 per minute.
9.25	Left auricle 176 per minute, left ventricle 72 per minute.
9.25½	Auricle and ventricle in accord 200 per minute ; systole is hard and diastole imperfect.
9.27	Heart very rapid, counted 264 per minute.
9.27½	Left ventricle stops and immediately relaxes.
9.27.50''	Right ventricle stops and immediately relaxes.
	Right ventricle responds to stimulus, left does not ; no fibrillating in either.

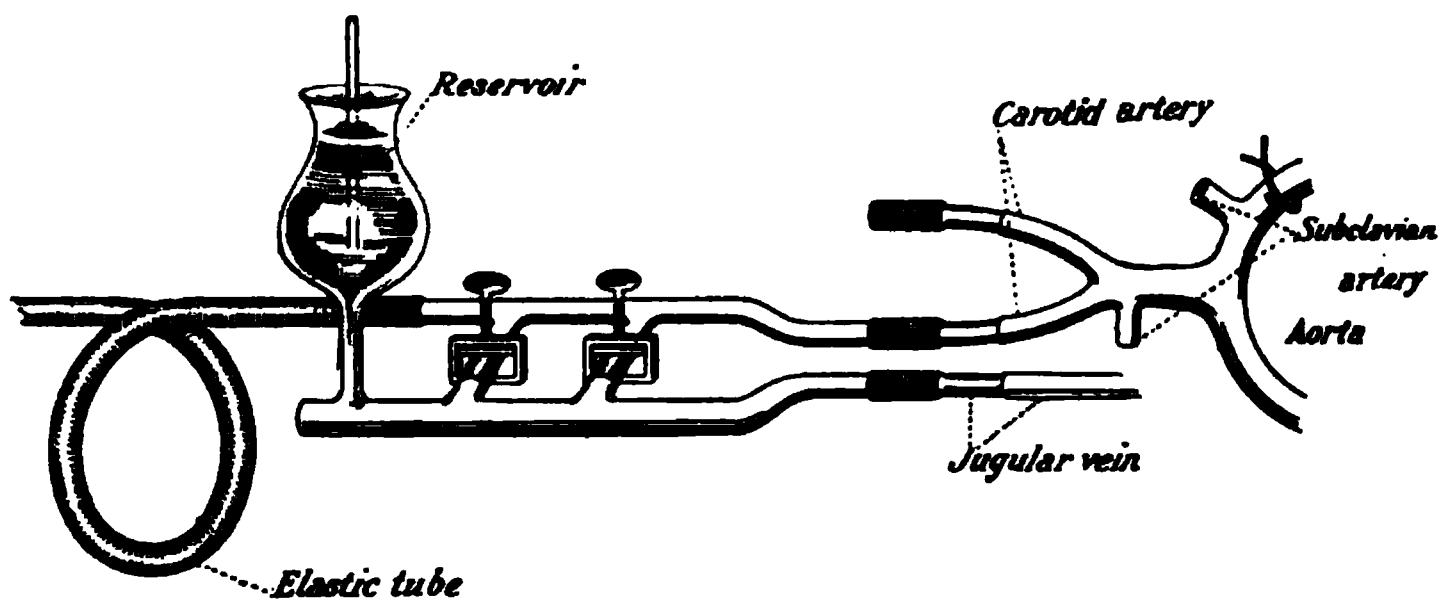
Overwhelmingly large doses of these drugs seem to paralyze the heart muscle directly without inhibitory paralysis, and very promptly, as is shown by the following experiment :

EXPERIMENT IV.—Digitalin. Dog, weight 3.8 kilos.

12.05	Thorax opened.
12.06	Heart 186 per minute.
12.06½	Inject 0.10 gm. digitalin.
12.07	Heart 42 per minute.
12.09	Inject 0.10 gm. digitalin.
12.09½	Heart stops in diastole ; no fibrillation.

More elaborate studies of the effect of digitalis on the mammalian heart were made with the method described by J. Bock.¹⁶ The method did not yield in our hands quite so satisfactory results as those that its originator seems to have obtained, but has points which make it a method of some value. As practised by us, Bock's method is as follows : The trachea is exposed in the ordinary manner and a respiratory canula inserted. The pectoralis major and sternomastoid muscles are then separated from their sternal attachments. A stout ligature is placed around the sternum on a level with the first rib, and the tip of the

FIG. 5.



bone above the ligature is cut away with bone forceps, exposing the subclavian arteries, which are ligated. Tension is made on the ligature attached to the sternum, and with the left subclavian as a guide careful dissection is made down to the aorta, around which a ligature is placed, but not tied. A large canula is then inserted into one jugular vein low down. Artificial respiration is now begun, and one carotid connected with a manometer. The other carotid is connected with a series of glass tubes (see Fig. 5) representing the peripheral vessels. These tubes are filled with leech extract and supplied from a reservoir with a dilute solution of the same. Immediately before ligating the aorta, which is the final step in the operation, an intravenous injection of leech extract, made so that one leech head is given for each kilo body-weight, is given in order to prevent coagulation of the blood. As a test of the thoroughness of the ligation of the aorta we used the femoral pulses, which, of course, are absent if the vessel is entirely occluded.

Bock states that under such conditions cardiostimulants cause a rise of pressure in the manometer, and mentions the digitalis-like poison, helleboreine, as causing such a rise. We ourselves never obtained any such elevation of the pressure by digitalis, but are inclined to attribute our failure to faulty technique rather than to lack of power of the drugs.

The first effect of digitalin and digitalis was to cause a slowing of the pulse. In Experiment XI. with digitalis, as section of the vagi caused an increase in the pulse rate, it is evident that the centres in the medulla were not absolutely dead, probably one of the subclavians was insecurely tied. Simultaneously with the decreased rate an increased force of the pulse is to be noted. This increase in the pulse-wave varied always parallel to the slowing, and might be well due to the inhibitory stimulation. In Experiment XI. the same course of events as described in the blood-pressure curves is seen, namely, the sudden increase in the rate of the heart due to inhibitory paralysis (as is shown by the powerlessness of the electric current to inhibit the cardiac action).

In Experiment XII. we have, however, a very different termination. The heart, instead of becoming very rapid, becomes very slow and full. This condition was entirely independent of any inhibitory influence because it was not affected by atropine. The exact signification of this experiment we are unable to determine; the most plausible explanation we have to offer is that under the drug the muscle was increased in its extensibility (see Donaldson and Stevens), undergoing a sort of dilatation with little loss of power. At the same time the irritability of the muscle was depressed so that an ordinary degree of intracardiac pressure was unavailing to excite, and the heart refused to respond until overdistended with blood, while the capability for contraction was unaffected. Experiment III., in which we found the auricles beating two or three times as fast as the ventricles, may have some interest in this connection, although, of course, in that case the heart was under the influence of pneumogastric stimulation.

DOSAGE. From the foregoing account of our experiments it is seen that both digitalin and digitoxin are circulatory stimulants of considerable power, resembling closely, if not identical with, digitalis tincture in their pharmacological activities. Nevertheless neither of them has achieved such clinical results as to gain the full confidence of the profession, the general verdict being that digitalin is "uncertain" in its action. It is hard to see why an active principle representing, as this one seems to, the full therapeutic virtue of a drug, should be less uniform in its results than the cruder preparation. And it is to our minds equally as improbable that a substance should affect so powerfully and certainly the circulatory system of a dog and not that of man. In this connection it may be remembered that some years ago the tincture of digitalis was dubbed "uncertain," but since we have learned to

give it in equivalent dose it has proven itself equal to the infusion in efficiency. We think the same mistake concerning digitalin is hindering the profession from the use of a valuable remedy. Ordinarily the dose is stated to be 1 to 2 milligrammes ($\frac{1}{80}$ to $\frac{1}{40}$ of a grain), and the clinician blames the drug for failing to act. Several years ago Dr. Beates²² quite startled some of the more conservative practitioners of medicine by advising them to give digitalin in half-grain (0.12 gramme) doses, and telling of excellent results achieved in this way. Dr. Beates' doses agree so closely with those that we have arrived at by reasoning from our experiments that it seems surprising no one else has before this confirmed his statements.

From the appended tables it will be seen that the smallest amount of the drug which caused any distinct symptoms of poisoning was 3.5 milligrammes per kilo, while in no case did less than 7.5 milligrammes prove fatal. If we estimate the weight of a man at 70 kilos (157 pounds), it would require to cause any toxic manifestations 0.245 gramme.* Moreover, it is to be remembered that these amounts were injected intravenously, and consequently reached the vital centres in a much greater concentration than if the remedy had been taken by the mouth. The doses given in our tables agree closely with those of Boehm and are somewhat smaller than those of Bardet.

DIGITALIN.

Experiment.	Weight of dog.	Toxic† amount.	Fatal amount.	Toxic amount per kilo.	Fatal amount per kilo.	Remarks.
	5.5 kilos.	0.04 gm.	0.080 gm.	0.0078 gm.	0.0146 gm.	
Exper. III.	8.4 "	0.04 "	0.18 "	0.0048 "	0.0214 "	
" VIII.	8.0 "	0.04 "	0.06 "	0.0050 "	0.0075 "	Vagi divided.
	12.3 "	.....	0.16 "	.....	0.0130 "	Atropinized.
" VI.	17.0 "	0.06 "	0.22 "	0.0035 "	0.0139 "	Atropinized.
" II. (p. 174)	6.0 "	.....	0.10 "	.....	0.0167 "	

DIGITOXIN.

Table X.	11.5 kilos.	0.016 gm.	0.028 gm.	0.0014 gm.	0.0024 gm.	
" IX.	9.2 "	0.012 "	0.036 "	0.0018 "	0.0039 "	
	5.0 "	0.010 "	0.020 "	0.0020 "	0.0040 "	Atropinized.
Exper. II. (p. 174)	4.7 "	.....	0.010 "	.....	0.0021 "	

There are, however, several objections which may be argued against conclusions arrived at in such a manner. In the first place, of course, we do not wish to poison our patient. To this we would say that the amount given (0.25 gramme) represents the physiological limit for the

* Approximately, $3\frac{1}{2}$ grains.
† Fall in the pulse-rate of ten beats per minute was regarded as a toxic manifestation.

dog. Two objections which are more valid are the well-known cumulative action of digitalis and the difference in susceptibility of the human and canine organisms. The most rational procedure to determine the therapeutic dose under these circumstances seems to us to be to compare its relative power to such a well-known preparation as the tincture of digitalis. The lethal dose for a dog of this tincture may be put at about 1 c.c. per kilo (see Tables I. and II.), and the toxic dose at about 0.3 c.c. per kilo body-weight. The average fatal dose of digitalin for the dog was in our experiments 0.0145 per kilo of body-weight, and the toxic dose 0.0051. These figures will be seen to agree very closely with those of the tincture in the relation between poisons and fatal doses. We may safely state, then, that 0.015 gramme ($\frac{1}{4}$ grain) of digitalin about equals 1 c.c. (16 minims) of tincture of digitalis representing 0.15 gramme of the leaves. We hope in a future paper to report clinical confirmation of these doses.

As for digitoxin, Koppe¹⁷ gives the fatal dose as 1.5 milligramme per kilo, and Franck²¹ as 2.3 milligrammes per kilo. In our own experiments the average fatal dose was 3.1 milligrammes per kilo. By averaging all these results and reasoning as above we would obtain 0.0023 as the therapeutic dose for a man. Koppe, however, poisoned himself quite severely with a single dose of 0.002 gramme, although 0.001 gramme had no effect on him three days previously. Wenzel,¹⁸ von Starck,¹⁹ and Masius²⁰ all report good effects from digitoxin in doses of $\frac{1}{4}$ to $\frac{1}{2}$ milligrammes several times a day. The irritant properties, however, of this drug render it less fit for human medication on account of the liability to upset the stomach if given per os, or to cause abscesses if given hypodermatically. Another objection to its use is its insolubility, which renders it irregularly absorbed and slowly eliminated, and hence very liable to accumulate in the system or to act with varying degree of power.

CONCLUSIONS. 1. Digitalin and digitoxin each represent the full circulatory powers of digitalis.

2. Digitalis, digitalin, and digitoxin stimulate the cardio-inhibitory mechanism both centrally and peripherally. In larger doses they paralyze the intrinsic cardio-inhibitory apparatus.

3. They all cause a rise of blood-pressure by stimulating the heart and constricting the bloodvessels.

4. Very large doses paralyze the heart muscle of the mammal, the organ stopping in diastole.

5. Digitalin of Merck is a stable compound, one gramme of it being equivalent to about 70 c.c. of tincture of digitalis.

6. Digitoxin is not to be recommended for human medication on account of its irritant action, which makes it liable to upset the stomach when given by the mouth or to cause abscesses when given hypoder-

matically, and on account of its insolubility, which renders it slowly absorbed and irregularly eliminated, having a marked tendency to cumulative action.

TABLE I.—Tincture Digitalis. Dog, weight 16.8 kilos.

Time.	Press.	Pulse.	
Beginning	136	210	
0' 25''	.....	.....	Injected 1 c.c. tincture digitalis.
0 30			
1 0	144	216	
1 25	.....	.....	Injected 1 c.c. tincture digitalis.
1 30			
2 10	156	210	Pulse about normal.
3 30	174	246	Pulse about normal.
4 10	154	114	Pulse large, regular.
5 40	146	234	Pulse small, regular.
6 0	.....	.....	Injected 1 c.c. tincture digitalis.
6 5			
6 40	156	102	Pulse waves very large, regular.
7 40	.....	.....	Injected 1 c.c. tincture digitalis.
7 45			
8 20	190	65	Pulse waves 16 m.m. and dicrotic.
9 20	148	228	Pulse waves small, regular.
9 30	.....	.....	Injected 1 c.c. tincture digitalis.
9 35			
10 5	.....	.....	Injected 1 c.c. tincture digitalis.
10 10			
10 50	.....	.....	Injected 2 c.c. tincture digitalis.
11 0			
11 30	.....	.....	Injected 2 c.c. tincture digitalis.
11 35			
12 10	150	246	Pulse waves small and irregular.
13 30	.....	.....	Injected 2 c.c. tincture digitalis.
13 40			
14 0	.....	.....	Injected 2 c.c. tincture digitalis.
14 10			
14 40	148	222	Pulse waves small and regular.
15 10	.....	.....	Injected 2 c.c. tincture digitalis.
15 20			
15 30	.....	.....	Heart stopped beating; thorax opened quickly, and heart found in diastole. Right ventricle responded to stimulus, left ventricle did not respond. After massaging heart for a few minutes both ventricles responded to stimulus, but only feebly.

Total dose, 16 c.c. tincture.

TABLE II.—Tincture Digitalis. Dog, 9.8 kilos

Time.	Press.	Pulse.	
Beginning	122	198	
1' 20''	.....	.....	Injected 2 c.c. tincture digitalis.
1 30			
2 0	116	114	
2 10	.....	.....	Injected 1 c.c. tincture digitalis.
2 15			
3 0	122	108	Fig. 6.
3 50	.....	.....	Injected 2 c.c. tincture digitalis.
4 0			
5 0	84	42	Pulse waves large and regular.
6 0	Injected 0.02 gm. atropine sulphate.
6 10			
6 30	160	198	Pulse waves larger than normal, and regular.

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Time.	Press.	Pulse.	
6' 40''	Injected 2 c.c. tincture digitalis.
6 50			
7 10	124	198	Pulse waves small and regular.
7 40	.....	.....	Injected 3 c.c. tincture digitalis
7 50			
7 55	.....	.....	Heart stopped. Heart in diastole—Flimmer. Does not respond to stasia.
Total dose, 10 c.c.			

FIG. 6.

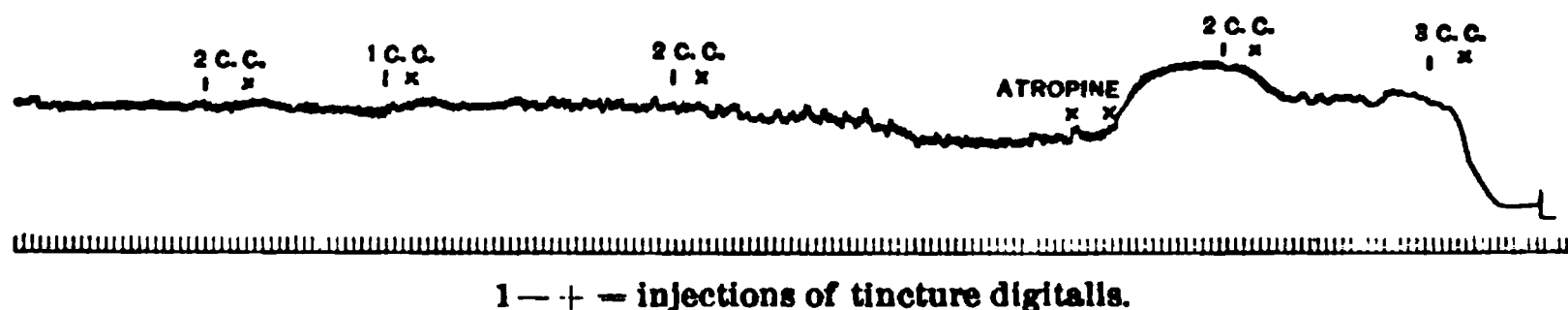


TABLE III.—Digitalin. Dog, weight 8.4 kilos.

Time.	Press.	Pulse.	
Beginning	114	108	
0' 30''—0' 50''	.....	.....	Injection 0.04 gm. digitalin.
1 0	120	87	
1 20—1 30	.....	....	Injection 0.02 gm. digitalin.
1 35	140	63	Pulse waves large, occasionally dicrotic.
2 15—30	.....	.....	Injection 0.02 gm. digitalin.
3 0—15	.....	.....	Injection 0.02 gm. digitalin.
3 30	144	84	
4 15	159	126	Heart somewhat irregular.
4 20—30	.....	.....	Injection 0.02 gm. digitalin.
5 0	.....	.....	Injection 0.02 gm. digitalin.
5 20	150	168	Pulse waves small.
9 0	156	190	
9 15—30	.....	.....	Injection 0.02 gm. digitalin.
9 30	.....	.....	Heart stopped. Chest opened; heart found in diastole, and not irritable.
Total digitalin, 0.18 gm.			

TABLE VI.—Digitalin and Atropine. Dog, weight 17 kilos.

Time.	Press.	Pulse.	
Beginning	142	96	
0' 5''	.....	.....	Inject 0.02 gm. atropine sulphate.
1 10	.....	.....	Inject 0.05 gm. atropine.
1 40	136	150	
1 45	.....	.....	Inject 0.04 gm. digitalin.
2 05	.....	.....	Inject 0.02 gm. digitalin.
2 55	168	162	
4 0	.....	.....	Inject 0.04 gm. digitalin.
4 20	96	162	
4 50	.....	.....	Inject 0.04 gm. digitalin.
5 15	.....	.....	Inject 0.04 gm. digitalin.
6 20	190	192	
6 25	.....	.....	Inject 0.04 gm. digitalin.
6 45	159	.....
7 10	224	204	Inject 0.04 gm. digitalin.
7 15	.....	.....
7 40	.....	.....	Heart stops. Chest opened; heart in diastole; does not respond to stimulus. Respiratory movements persist after cardiac arrest.
Total digitalin, 0.22 gm.			

TABLE VII.—Digitalin. Dog, weight 9.5 kilos.

Time.	Press.	Pulse.	
Beginning	80	84	
0' 10''-20	.....	.....	Inject 0.02 gm. digitalin
1 20	104	69	
4 30-40	.....	.....	Inject 0.04 gm. digitalin.
5 0	122	72	
5 25	.....	.....	Both vagi divided.
5 30	153	126	Experiment ended.

TABLE VIII.—Digitalin. Dog, weight 8 kilos

Time.	Press.	Pulse.	
Beginning	167	174	Both vagi have been divided.
0' 10''-20	.....	.....	Injection 0.04 gm. digitalin.
1 0	200	90	
2 40	140	186	Pulse waves small.
7 0	210	240	
8 0-10	.....	.....	Injection 0.02 digitalin.
9 20	.....	.....	Heart stopped. Chest opened ; heart found in diastole, right side irritable, left not. Respiratory movements continued after heart had ceased.

TABLE IX.—Digitoxin. Alcoholic Solution. Dog, weight 9.2 kilos.

Time.	Press.	Pulse.	
Beginning		146 162	
0' 45''-0' 58''	.....	.....
1 10		156 180	Inject 0.004 gm. digitoxin
1 30-1 40	40	.....
2 20		160 150	Inject 8 mgm. digitoxin.
2 30-2 35	35	.....
3 10		150 90	Inject 8 mgm. digitoxin.
3 20-3 25	25	.....
4 0		126 90	Inject 4 mgm. digitoxin.
4 10-4 15	15	.....
4 50-5 0	0	.....
5 30		172 84	Inject 4 mgm. digitoxin.
6 10		192 186	Inject 8 mgm. digitoxin.
6 50		.....	Pressure fell to 0 rapidly ; heart stopped.
7 0		.....	Vagi cut ; no effect. Heart in diastole ; responds feebly to stimulus. Massage causes weak beats for a few seconds.

Total dose, 0.036 mg.

TABLE X.—Digitoxin. Dog, weight, 11.5 kilos. Chloretone anæsthesia.

Time.	Press.	Pulse.	
Beginning	130	192	
0' 5''	.....	.....	Inject 0.002 gm. digitoxin alcoholic solution.
0 45	142	192	
1 0	.....	.....	Inject 0.002 gm. digitoxin solution.
1 30	156	190	
2 10	.....	.....	Inject 0.004 gm. digitoxin.
2 50	172	190	
3 0	.....	.....	Inject 0.004 gm. digitoxin.
4 10	.....	.....	Inject 0.004 gm. digitoxin.
4 40	174	180	Pulse waves slightly larger.
5 20-40	.....	.....	Inject 0.008 gm. digitoxin.
6 0	176	162	
7 30	136	120	Deep inspirations
8 20	120	60	
8 40	220	252	
9 10	.....	.....	Inject 0.004 gm. digitoxin.
9 30	.....	.....	Heart stops. Chest opened ; heart found in diastole responding feebly to stimulus.

Total amount digitoxin, 0.028 gm. Per kilo. 0.0035.

TABLE XI.—Bock's Method. Tincture of Digitalis. Dog.

Time.	Rate of pulse.	Height of pulse.	
Beginning	126	18	
0' 10''-30	.....	...	Injection 1 c.c. tincture digitalis.
1 30	114	18-24	
8 0	126	17	
8 5-8 15	.....	...	Inject 1 c.c. tincture digitalis.
9 15	114	17	
13 0	.....	...	Inject 2 c.c. tincture digitalis.
14 0	99	23	
14 30-40	.....	...	Inject 2 c.c. tincture digitalis.
15 20	84	31	Occasional diastolic pauses (Fig. 7).
16 30 }	.....	...	Two vagi successively cut.
17 30 }			
17 35	111	20	
18 30	.....	...	Inject 1 c.c. digitalis (Fig. 8).
19 30	156	8-14	
19 35	.....	...	Inject 1 c.c. tincture digitalis.
20 0	168	7	Systole hard, diastole never complete.
28 0	162	10	Electrical stimulation of vagus without effect.

FIG. 7.

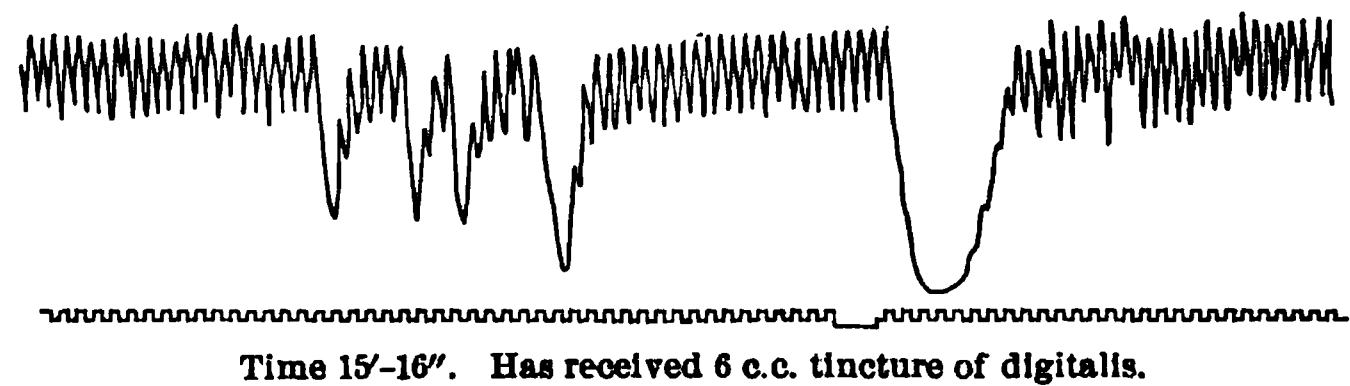


FIG. 8.

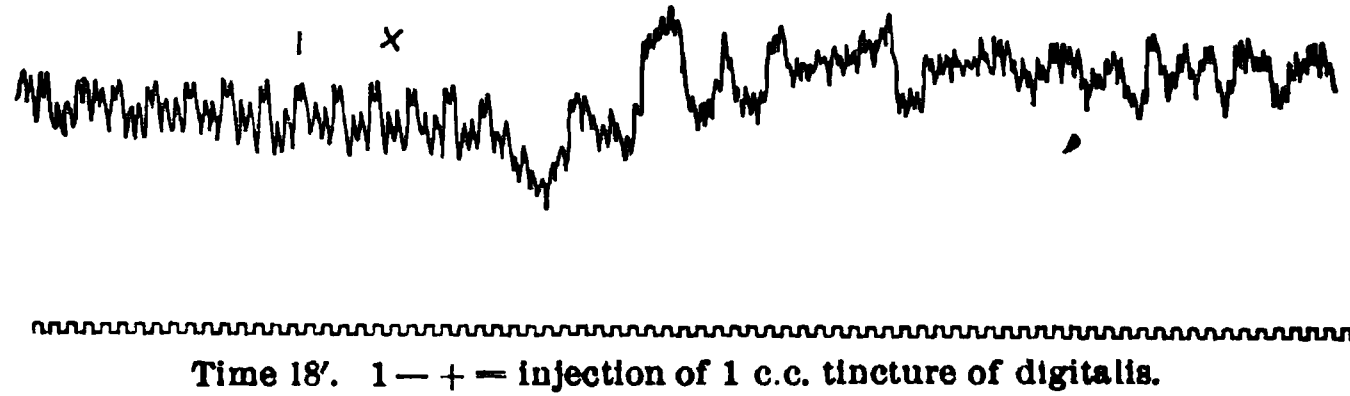
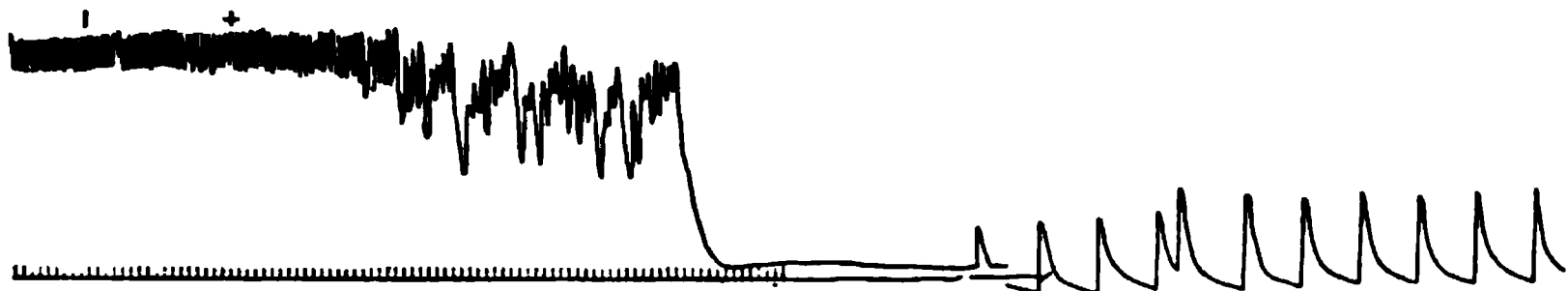


TABLE XII.—Bock's Method. Digitalin Germanicum. Dog, weight 7.1 kilos.

Time.	Rate of pulse.	Height of pulse.	
Beginning	123	14	
0' 10'' }	.....	...	Injection 0.004 gm. digitalin solution.
1 10 }			
2 10	96	20-32	Periodically occurring vagus pulses.
3 30	.....	...	It was here found that the aorta was not [securely ligated.
7 0	114	25	
7 30 }	.....	...	Inject 0.002 gm. digitalin.
8 30 }			
9 0	114	26	
12 0 }	.....	...	Inject 0.004 gm. digitalin.
12 45 }			
13 15	126	19	
22 0	108	17	

Time.	Rate of pulse.	Height of pulse.	
22' 10'' } 22 15 }	.....	...	Inject 0.004 gm. digitalin.
23 0 } 23 20 }	.....	...	Inject 4 mg. digitalin.
24 0-15	.....	...	Inject 4 mg. digitalin.
25 0 } 25 15 }	.....	...	Inject 4 mg. digitalin.
25 35	105	22	
25 40-55	.....	...	Inject 4 mg. digitalin.
26 25	72	24-32	Long diastole pauses (Fig. 9).
26 40	.....	...	Heart stops for twenty seconds.
27 20	10	52	(Fig 9.)
28 0	.....	...	0.005 gm. atropine sulphate without effect.
34 0	.....	...	Heart stops in diastole ; responds to irritation.

FIG. 9.



Time 25'-30''. 1 — + — injection of 0.004 gm. digitalin.
Animal had previously received 0.026 gm. digitalin.

TABLE XIII.—Bock's Method. Digitalin. Dog, weight 9.6 kilos.

Time.	Rate of pulse.	Height of pulse.	
Beginning	102	30-40	
0' 10''	.....	...	Inject 0.004 gm. digitalin.
1 30	.....	...	Inject 0.004 gm. digitalin.
2 30	84	46-64	
3 30	.....	...	Inject 0.004 gm. digitalin.
5 0 } 7 20 }	Inject 0.016 gm. digitalin in four doses.
8 0	72	36-54	Experiment ended.

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MULTILOCULAR CYSTOMA OF THE PANCREAS.

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NUMEROUS cases of cystic tumors of the pancreas have been reported of late years, especially in consequence of the attention which surgeons have directed to lesions of the abdominal viscera. A critical review of the literature of the subject, however, makes it evident that the term pancreatic cyst has been used to indicate lesions differing in etiology, clinical characteristics, and in the results of treatment. Virchow (*Die Krankhaften Geschwülste*, 1863, i. 276) describes two separate varieties under the term *ranula pancreatica*. In the one the entire duct is widened and an ordinary rosary-like dilatation occurs; in the other the duct becomes dilated into a cyst, the contents of which may be slimy, hemorrhagic, or even calculous material.

Nearly twenty-five years later (*Berl. klin. Woch.*, 1887, xxiv. 248) he finds it no longer easy, especially when the cysts are large, to discriminate between the varieties of cystic tumor which may occur in the vicinity of the pancreas. He looks forward to the time, however, when the method of origin of the larger cysts may become more clearly established.

One of the most important contributions to the differentiation of the large cysts in the region of the pancreas was made by Jordan Lloyd (*Brit. Med. Journ.*, 1892, ii. 1051), when he maintained that such cysts might occur in consequence of an injury to this gland as a result of which the wall of the lesser omental sac becomes inflamed and an accumulation of liquid exudation is retained within its cavity. The simultaneous laceration of the pancreas permits the specific secretion of the gland to be mingled with the serous exudation of the omental bursitis.

Occasional instances of multilocular cystic tumors of the pancreas have been reported and have been described as simulating in gross appearances and in structural characteristics the multilocular cystoma of the ovary. Bozeman (*New York Med. Journ.*, 1882, xxi. 46), for instance, removed from the abdomen of a woman, aged forty-one years, a cystic tumor which Garrigues (*Med. Rec.*, 1882, xxi. 286) subsequently described. It consisted of a principal cyst holding two and a half gallons of brown liquid. The wall was trabeculated, the partitions contained large holes, and it bore several secondary cysts of the size of small hen's eggs. The walls were lined with cylindrical or polygonal epithelium, and the hardened section showed that the formation of the secondary cysts took place as in an ovarian cyst. The patient of Riedel (*Arch. f. klin. Chir.*, 1885, xxii. 994), a woman, forty-five years

old, had a tumor in the upper abdomen for nine years, at first not producing any symptoms. In the last year and a half it had increased so rapidly in size that the entire abdomen was filled with a fluctuating tumor thought to be of ovarian origin. Laparotomy was performed, and the cyst was punctured; ten litres of brown fluid escaped, and the tumor was removed. Death occurred four days later. The cysts had an adenoid projection from the wall, several globular spaces communicated directly with the interior, the spaces being lined with cylindrical epithelium, and others had papillary elevations, as in ovarian cystoma. Paltauf examined the body of a female patient of Selzer, aged forty-two years (*Zeitschr. f. Heilk.*, 1886, vii. 19). Death was due to cancer of the breast, but he found a tumor twice the size of a man's fist apparently continuous with the pancreas. Its contents were a thick, slimy, grayish-brown fluid. From the anterior and lower portions of the cyst projected two globular, lobulated masses, the one as large as an apple, the other the size of an egg. They were separated from the main cavity by widely perforated septa, and were composed of an aggregation of smaller cysts. The walls were lined with cylindrical epithelium, and the pancreatic duct was found within the gland.

In Kuhnast's case (*Inaug. Diss.*, Breslau, 1887, 77), a man of fifty-one years, the body of the pancreas was found after death to be made up of cysts, one as large as a medium sized apple. All the cysts were filled with blood in various stages of metamorphosis. Almost the entire gland was transformed into fibrous tissue and the dilated duct was to be traced here and there through the cystic portion.

The case reported by Martin (*Virchow's Arch.*, 1890, cxx. 230) perhaps belongs in the same series. He successfully removed from the region of the pancreas of a woman, fifty years old, a cystic tumor which filled the entire abdomen. It had first been observed when she was twenty-one years of age, and then was the size of an egg. When the patient was thirty-four years old the tumor was as large as a man's head and was thought to be of ovarian origin. An exploratory laparotomy at this time showed the growth to be behind the transverse colon, and the wound was closed. At the final operation fifteen litres of a thick, brown fluid escaped from the cyst, which was isolated except at one end, where it was tied and cut away, leaving a stump about two fingers' thick. A portion of the wall contained a large number of cysts varying in size from that of a hazel-nut to a goose egg. All were lined with cylindrical epithelium, and no pancreatic duct was found.

Gussenbauer (*Prag. med. Woch.*, 1891, xvi. 365) drained a cyst in the region of the pancreas of a woman, twenty-eight years of age. The tumor was first noticed two and a half years before the operation. It then was as large as a fist, but within the last six months had rapidly increased in size until it was as large as a man's head. Several months

after the operation the patient died of phthisis, and Chiari made the post-mortem examination. He found a fistula extending from the abdominal incision to the pancreas, and the left half of the latter was replaced by a collection of cysts, the largest the size of a hen's egg. The smaller cavities were lined with a cylindrical epithelium. The pancreatic duct was opened from the duodenum to the cysts.

Thirolloix and du Pasquier (*Bull. de la Soc. Anat.*, 1892, lxvii. 310) found nearly the whole pancreas of an elderly woman transformed into a mass of cysts—the largest the size of a hen's egg, the smallest less than the size of pease, the whole forming a tumor twice as large as a fist. There was no constriction of the duct of Wirsung.

Cibert (*Gaz. des Hôp.*, 1896, lxix. 347) reports the results of his examination of a cystic tumor successfully removed by Poncet from a woman, twenty-six years old. The growth first was noticed six years before the operation, and increased slowly for four years. Just before the operation it was apparently of the size of the head of an adult. A large cyst was found, in the wall of which were smaller cysts no larger than hazel-nuts. These were lined with cylindrical epithelium, and the wall of the main cyst was traversed by long ridges enclosing communicating spaces.

The above series include all the cases of benign multilocular cysts of probable pancreatic origin I have been able to collect. It is noteworthy that all, with but one exception, have occurred in women; that, as a rule, the growths have existed for a number of years without much change or proving a cause of disturbance; and that rapid increase in size is usually the result of the formation of a single large cyst.

The walls were lined with cylindrical epithelium, and the comparison between them and the ovarian cyst was often made. The statement of the microscopical appearances, however, is not sufficiently detailed to convince the reader that these multilocular cysts were other than retention cysts proceeding from the smaller branches of the duct of Wirsung.

The following case is reported for the purpose of confirming the view that a multilocular cystic tumor, presumably of pancreatic origin, may occur in the region of the pancreas, and belong to the group of proliferating cysts:

Mr. —, thirty-six years of age, born in Maine, a carpenter and builder, was sent to me October 23, 1899, by Dr. C. D. McCarthy, of Malden, to whom he had been referred by Dr. Tenney, of the same city. There was no evident hereditary predisposition to disease, and the previous health had been excellent, there having been no serious illness since boyhood, when pneumonia had occurred. Syphilis was denied. He was temperate in the use of alcohol and a total abstainer from tobacco. Tea and coffee were used freely, and he was in the habit of drinking two or three glasses of water at his meals.

In the spring of 1899 he was in his usual good health, but in July he

began to complain of a constant dull pain in the left lumbar region, and extending into the dorsal region. It was worse when lying down at night, but was less discomforting when he lay upon his back. The pain gradually increased in severity, until at the end of two or three months it ceased, after the application of tincture of iodine for three or four days. Within the past month he has noticed in the left hypochondrium a swelling, which has increased a third in size during this time.

Throughout his illness he has not been obliged to restrict his diet, and the appetite has been good. During the past month it has been excessive, and there has been also marked thirst. Immediately after eating the food would seem like a weight in the stomach, and there would arise a sense of exhaustion, lasting for a few minutes, or even for a half-hour. More or less belching of gas would occur, a rumbling in the abdomen was frequently to be heard, and peristalsis in the epigastrium was occasionally to be seen. Of late he has had nausea at times, although vomiting is rare. The bowels have been constipated, but the dejections are not unnatural in appearance.

In the past week or two there have been attacks of palpitation, sometimes relieved by the expulsion of gas. During the same period he has felt faint and has looked pale for a while two or three times daily, and has suffered more or less from dull pain in the temples. He has no cough, but is somewhat short-breathed on ascending an elevation. His breath at times smells queerly.

During the past month he has been obliged to micturate six or seven times during the night, and then passes over two quarts of urine, although not more than a pint in the daytime. There is nothing abnormal in the appearance of this secretion. The skin has been dry throughout the illness, although during the summer months he would sweat at night. He has gained five or ten pounds in weight, but has lost so much strength that he has ceased work on this account. His legs easily tire, but his feet do not swell.

On physical examination the face was pale; temperature, 99° F.; pulse, 88; respirations, 20. The heart and lungs were negative, with the exception of the presence of a systolic murmur at the base and apex of the heart. The urine was 1044, alkaline, with a slight trace of albumin, but no sugar. The examination of the blood showed 4,912,000 red corpuscles, 10,000 leucocytes, and 70 per cent. of hæmoglobin.

The epigastrium and left hypochondrium were swollen and tense from the presence of a rounded resistant tumor extending downward and backward to the vicinity of the left twelfth dorsal vertebra, thence forward three finger-breadths above the crest of the ilium toward the median line. The upper border as determined by dulness on percussion was as high as the left nipple. The lower border formed a sharply defined rounded surface. The tumor was elastic, of doubtful mobility, and presented a rounded prominence from the upper just below the left lower costal cartilage in the mammillary line. A wave was to be recognized in the left portion of the tumor. The position of the mass behind the stomach was indicated by the overlying tympany in the upper epigastrium, with easy upward displacement of the gas, and by the ready production of a splashing sound in front of the upper portion of the tumor.

The patient was sent to the Massachusetts General Hospital for further observation. October 30, 1899, ten grammes of glucose were given

in divided doses, but no sugar was to be found in the urine subsequently passed. After salol was taken no urine was voided for six hours; the specimen then examined gave the reaction characteristic of the presence of salicylic acid.

A diagnosis of cyst of the pancreas was made, and the patient was transferred to Dr. M. H. Richardson's ward for surgical treatment.

November 7, 1899. An incision seven inches long was made over the tumor, two inches to the left and parallel with the median line. The tumor was found to occupy the region of the lesser omental cavity. A trocar was pushed through the wall and a considerable quantity of reddish brown fluid escaped. It was apparent that the cyst was multilocular, the separate cysts, some of which were nearly as large as the fist, not being intercommunicable. The intervening septa were torn through, as much of the contents removed as possible, and the sac was then sepa-

rated from the surrounding parts and detached. Diseased portions of what was supposed to be the pancreas, but having a malignant look, were removed with the tumor. Six weeks later the patient was discharged relieved. At the site of the wound was a sinus at least two inches deep, from which a slight discharge escaped into the dressings.

A portion of the liquid contents of the tumor was examined in the laboratory of Prof. E. S. Wood by his assistant, Mr. H. C. Smith, with the following result:

Quantity, 250 c.c.; color, dark brown; sp. gr., 1022; reaction, alkaline. Considerable free blood present, but no pancreatic ferment.

Solids	7.32 per cent.
Urea	0.18 "
Albumin	1.66 "
Ash	0.81 "
Chlorine	0.32 "
NaCl.	0.58 "

Dr. W. F. Whitney received the fresh specimen and forwarded the following report:

"Hemorrhagic cystadenoma; a cystic mass the size of a squash, of a dark-red color, indicating extensive hemorrhages, with a very soft necrotic tissue mingled with dark-red fluid. No definite pancreas could be made out, though some of the hemorrhagic masses suggested a piece of the pancreas, and another an infiltrated adrenal gland. A little piece of the tissue was soft, grayish, and rather malignant-looking to the eye."

On microscopic examination of hardened and stained sections, rounded and irregularly sinuous cavities of various size were to be seen, some with incomplete septa, others with projecting papilliform growths. Some of the cavities contained granular, fibrillated, or hemorrhagic material; others were filled with papilliform growths grouped in a somewhat irregular manner. The contents were occasionally cellular, the cells being free or clumped, at times in tufts. Many of the cavities were lined with a cylindrical epithelium, which was more or less stunted in the larger cysts. Some of the papilliform growths bore a cylindrical epithelium, while others were covered with cuboid cells. Occasionally the distribution of the epithelial cells suggested the acini of the pancreas, but the normal structure of this gland was not seen in any of the sections examined. The connective tissue between the cysts in places was densely fibrous, while elsewhere it contained numerous cells and was composed of interlacing fibrils, the latter forming a meshwork enclosing a more or less homogeneous intercellular substance. Large and thin-walled bloodvessels were numerous. In places granules of blood-pigment and agglomerated red blood-corpuscles gave evidence of old and recent hemorrhages, while extensive areas of necrosis, in which the structural details were well preserved, were not infrequent. It was in their vicinity particularly that the thin-walled bloodvessels and the hemorrhages predominated.

Although the above-mentioned characteristics prevailed in the sections examined, in a few of the latter a tendency to the atypical growth of epithelioid cells was apparent. The cells were of a cylindrical character, but by no means of a uniform shape, size, and arrangement, and were grouped in a tubular form, but the tubules often were so closely approximated as to present an irregularly alveolate appearance.

The tumor, from its histological appearances, thus is to be regarded as essentially a multilocular cystoma, but on the border line between a proliferating cystoma or cystadenoma and a cystomatous carcinoma, a distinction which the subsequent history of the patient may be expected to make clear.

Combinations of cystoma and carcinoma in pancreatic tumors have been reported in rare instances. Hartmann (*Cong. Franc. de Chir.*, 1881, 618) records the case of a woman, fifty-three years old, who had suffered from digestive disturbances for some time, but within three months had rapidly become emaciated and enfeebled. In this period there were abdominal pains, and a tumor appeared, seemingly as large as the two fists. Laparotomy was performed, and at the operation 200 grammes of brown, chocolate-like fluid were removed from the growth, which lay behind the stomach, and its cavity was drained. Death oc-

curred some six weeks after the operation. At the autopsy the entire body and tail of the pancreas were found to form a polycystic mass, through which the pancreatic duct could be followed. Cancerous nodules were found in the liver, and Gilbert, who examined the cysts, regarded them as representing a cystic epithelioma, with the new formation of glandular cul-de-sacs presenting a cystic dilatation.

Reference is made in the article just mentioned to a work published by Hanot and Gilbert (*Etudes sur les Maladies du Foie*, Paris, 1888), where a case is referred to in which a series of cysts of various dimensions were found in the pancreas. The tumor was generalized in the liver, and Gilbert regarded it as a tubular pancreatic epithelioma.

A CRITICAL SUMMARY OF THE LITERATURE ON THE INOCULABILITY OF CARCINOMA.

BY JOSEPH SAILER, M.D.

PERHAPS the most common experiment that has been made for the purpose of elucidating the true nature of malignant tumors is the inoculation of fragments of them into other living beings. The number of experiments of this nature is now very considerable, and the results are astoundingly at variance. They may be divided into certain general groups, depending in part upon the method of procedure, in part upon the animals used as subjects. In order that such experiments should be decisive it is necessary that certain precautions should be observed which in a general way resemble the rules laid down by Koch for the purpose of determining the relation of micro-organisms to disease. First, the nature of the original tumor should be carefully determined by microscopical examination. Second, the inoculation should be made under the most rigid aseptic precautions. The failure to observe this has caused at least one investigator to obtain results that are absolutely valueless. Third, the animal should be kept a sufficient length of time under observation. The maximum has never been determined, but it is conceivable that months or even years may elapse before the tumor develops. Fourth, if a tumor does develop its nature should be carefully determined by microscopical examination, and if it is similar to the original tumor it should be possible to continue the inoculations in other animals. It is, of course, desirable at present, when the parasitic theory of carcinoma is so widely accepted, to make all possible efforts to determine the existence of the

bodies that have been supposed to be parasites, and that have been found in tumors, and to make cultures from the original tumor and from the tumor that develops at the site of inoculation. It is advisable also, in view of the possible spontaneous occurrence of tumors in the lower animals, to keep always a certain number of controls and to make inoculations in sufficient number of animals to eliminate as far as possible any accidental development. These conditions have not been by any means carefully observed. The great majority of investigators have been satisfied by the mere injection or implantation of fragments of supposed carcinoma obtained from a human being, often not controlled by microscopical investigation, and then at the expiration of a limited period of time the animals have been killed and examined in order to see whether any tumor growth has taken place. Of course, under these circumstances negative evidence is practically valueless.

The experiments may be divided into the following groups: inoculation of the lower animals with tumors from other animals or from human beings; inoculation of human beings either with fragments of tumor from some other part of the body or with tumors from other human beings; finally, mediate inoculation with portions of tumors kept for some time outside the body or with cultures obtained from tumors.

Among the earliest experiments of this group were those of Novinsky (quoted by Geissler), who removed an alveolar epithelial tumor from the nose of a dog, and made with it forty-two inoculations into the skin of other dogs. Sometimes he inoculated it into places where the skin was irritated; in others where it was normal. In two of the latter situations tumors subsequently developed that upon histological examination were found to have the same structure as the original tumor of the dog's nose. Some very important experiments were reported by Wehr¹ and by Hanau.² Wehr took portions of tumors of the prepuce of dogs or of the mucous membrane of the vestibula and inoculated them into the subcutaneous connective tissue of twenty-six other dogs. Twenty-four nodules were obtained, five of which were examined microscopically, and in one case the tumors grew progressively until the death of the animal, which was brought about by rupture of the bladder as the result of the compression of the urethra by the tumor mass. The whole pelvic cavity in this instance was infiltrated, and metastases were found in other parts of the body. The microscopical examination is not recorded. Hanau inoculated fragments from the cancrroids of the vulva of a rat into the tunica vaginalis testis of other rats. One died at the end of seven weeks, after having developed diffuse carcinoma of

¹ Langenbeck's Archiv, 1889, vol. xxxix. p. 226.

² Ibid., p. 678.

the peritoneum. A second rat was killed at the end of eight weeks, and two tumors were found—one in the adrenal body and the other in the gubernaculum. A fragment of tumor from the second rat was inoculated into a third rat, which was killed three months later. At the point of inoculation there was considerable tumorous infiltration, and the whole of the peritoneum showed extensive metastases. Hanau regarded his experiments as completely successful, and they certainly fulfilled the conditions that were laid down at the beginning of this article. Nevertheless, on subsequent consideration¹ he became convinced that they did not necessarily prove the infectious origin of the cancer, but simply that the transplanted epithelial cells were capable of proliferating in their new environment, just as the transplanted epithelial cells of a skin graft can proliferate if placed in the midst of granulated tissue. Some years later Jenny² published the results of a careful histological examination of the various tumors that had resulted from these inoculations, which were found to consist of typical cancerous masses composed chiefly of epithelium that had undergone to a considerable extent horny degeneration and of cancerous stroma, proving that the tumors produced by the inoculations practised by Hanau were undoubtedly true cancers. Among the most valuable experiments of this type are those of Moreau,³ who found in a mouse that he had at his laboratory for some time a small tumor under the right axilla. This was removed and in part kept for histological examination, in part triturated with sterile normal salt solution. With this ten white mice were injected, and two died without lesions. The others in eight months developed tumors similar to the original. Another group of ten were inoculated with these, and in five months all had developed tumors. A group of mice born of parents suffering with tumors were also inoculated, and some of them developed masses as large as themselves. Other mice were fed with the tumor material, and developed tumors after some months. All these tumors, apparently developed in the connective tissue, were of an alveolar structure and contained epithelium that infiltrated the surrounding tissues. General metastasis rarely occurred unless some traumatism had been applied to the edge of the tumor. Other animals were also inoculated, but were not as susceptible as the white mice. Experiments performed with cancers obtained from human beings were negative. It was impossible to obtain cultures from the tumors by any method. Moreau concludes, and it seems impossible to contradict him, that the cylindrical epitheliomas of white mice are inoculable into other animals of the same species; that heredity apparently plays a considerable rôle in increasing the susceptibility of

¹ Fortschr. der Medicin, 1889, vol. vii., No. 9.

² Archiv f. klin. Chir., 1896, vol. li. p. 269.

³ Archiv de Med. Exper. et d'Anat. Path., 1894, vol. vi. p. 677.

the animals to the tumors, and also that the growth of the neoplasm is greatly increased by gestation. If the tumors are transferred to other animals of different species they apparently lose their virulence and inoculability.

Less satisfactory, because the experiment was not carried as far, is the work of Eiselberg.¹ He removed a fragment from a spindle-cell fibrosarcoma of the shoulder of a white mouse and inoculated it into the peritoneal cavities of two half-grown rats, in one of which the tumor continued to develop until it caused death at the expiration of five months. The tumor had the same histological characteristics as the primary growth. Pfeiffer (quoted by Geissler) has transmitted a melanotic tumor from one mouse to another.

Shattock and Ballance,² in the course of a series of experiments, transplanted fragments of carcinoma from one dog to others, but the results were always negative. Trasbot³ has transferred fragments of carcinoma from one dog into others, using every known method of inoculation. In one instance a small mass developed at the end of six weeks, but later disappeared completely.

Duplay and Cazin⁴ have made a great number of experiments, inoculating rats, guinea-pigs, rabbits, and dogs with fragments of carcinoma and sarcoma obtained from tumors occurring spontaneously in dogs. Inoculations were made subcutaneously, intraperitoneally, and intravenously, but the results were uniformly negative. In a subsequent communication,⁵ in which they referred to these experiments, they add that in one instance a tumor resembling in structure an inflammatory growth that had been found in the mucous membrane of the vagina of a dog was inoculated into a number of other dogs. In one of these, at the expiration of ten months, there was proliferation at the site of inoculation, and metastatic tumors of a distinctly epithelial structure in the testicles. In none of the others, however, were there any evidences of metastases. This case is, of course, extremely doubtful, and the authors, in another paper,⁶ in a careful review of the subject, reach the conclusion that there is not sufficient evidence at present to prove that cancerous and sarcomatous tumors are contagious, and that although it is not unlikely that they are infectious, their infectious nature is not at present understood. Geissler⁷ inoculated two dogs with fragments of papillomatous tumors of the penis found in dogs. In one a tumor appeared in three weeks at the site of inoculation that had the same structure as the original, but ultimately disappeared; in the other

¹ Wien. klin. Woch., 8d Jahrgang, 1890, No. 27, p. 927.

² British Medical Journal, 1891, No. 1576.

³ Centralb. f. allg. Path. u. path. Anat., vol. v. p. 394.

⁴ Semaine Médicale, 1892, p. 61.

⁵ Centralb. f. allg. Path. u. path. Anat., 1894, vol. v.

⁶ Semaine Médicale, 1893, p. 329.

⁷ Verhandl. der deutschen Gesellsch. f. Chirurgie, 24th Congress, Berlin, 1895, p. 87.

tumors appeared in three places at the end of five weeks. The animal became cachectic and died in eight months, and numerous metastatic nodules were found, and with them a third dog was successfully inoculated. Geissler does not consider the tumor a typical carcinoma. In the discussion that followed Geissler's report Hansemann stated that he believed the tumor was a mixture of sarcoma and granulation tissue, and Israel agreed that it was not carcinomatous. Rosenbach related an instance of successful transmission of sarcoma from one rat to another. Smith and Washburn¹ describe an infectious papilloma occurring in dogs which apparently attacks the epithelium of the sexual organs. They observed a number of cases of direct contagion, and in two cases made successful experimental inoculations. In the second of these the tumor subsequently atrophied. The authors regard these tumors as similar to those described by Wehr, Duplay and Cazin, and Geissler. Finally, with an allied type of tumor, the endothelioma that were found in three members of the same litter of white mice Eberth and Spude² made a series of transplantations into other white mice, using various methods of inoculation, but the results were invariably negative.

The most obvious experiments, of course, are those which consist of inoculating the lower animals with fragments of carcinoma removed from human beings. According to Hauser, if carcinoma is an infectious disease, such inoculations should be successful, because we know that certain of the lower animals, particularly the dog and rat, are frequently affected by cancerous growths. Among the successful early essays in this direction were those of Goujon (quoted by Geissler), who succeeded in producing a tumor in a rat as a result of inoculation of a fragment of carcinoma. The microscopical control of this tumor is not given. Klemke (quoted by Geissler) has also obtained a positive result in a horse by inoculating it with some of the scrapings of a melanotic carcinoma. It is, of course, questionable whether the tumor was not really a sarcoma.

Among the more modern experiments in this direction that were successful may be mentioned those of Power,³ who inoculated fragments of carcinomatous Paget's disease upon mucous surfaces that had been irritated for a long time. Fragments from Paget's disease gave, as he states, interesting results. The communication is brief, and there are no satisfactory details. But later⁴ he stated that he found in the proliferations the parasites of Ruffer—a very unsatisfactory proof of tumor formation. The experiments of Adamkiewicz⁵ consisted of

¹ *Journal of Pathology and Bacteriology*, January, 1898, vol. v. p. 99.

² *Virchow's Archiv*, 1898, vol. clxiii. p. 60.

³ *Journal of Bacteriology*, vol. i., No. 6.

⁴ *British Medical Journal*, 1893, vol. iii. p. 880.

⁵ *Untersuchungen über den Krebs und das Princip seiner Behandlung. Experimentel und klinisch.* Wien, and Leipzig, 1898.

implanting various tissues in different regions of animals. Fragments of carcinoma placed in the brain produced a characteristic reaction that he ascribes to an intense specialized intoxication. The symptoms appeared after two or three days, when the animals became sluggish, suffered from embarrassed respiration, then developed nystagmus and opisthotonos, and died. At the autopsy the brain was pale; there were no signs of inflammation, and cultures made from the tissues remained sterile. Adamkiewicz believes, as a result of these and other experiments, that carcinoma is a true infectious disease, in which the micro-organisms are represented by the so-called epithelial cells. These elaborate a poison—cancroin—that has a special affinity for nervous substances. The experiments were apparently made with reasonable antiseptic precautions. The fact that no cultures were obtained from the brain, if true, is of course of extreme significance. The validity of these experiments was soon tested by men whose statements carry weight. Paltauf,¹ in a review of Adamkiewicz's work, states that he had repeated these experiments with negative results. Geissler² inoculated twenty-five rabbits according to Adamkiewicz's method, employing, however, more elaborate aseptic precautions. Even with these he occasionally got positive results always due to septic infection; otherwise the animals showed absolutely no symptoms, although kept under observation for many months. In those that were killed for study the fragments of carcinoma, although tolerably well preserved, exhibited no tendency to proliferate, and produced exceedingly little reaction in the surrounding nervous tissue. Kopfstein³ implanted fragments of carcinoma into the brains of eight rabbits, and Kinscherf and Bartsch⁴ inoculated twelve rabbits with fragments of carcinoma. These were removed under the most careful antiseptic precautions and embedded in the brain-substance of the animals. Their results were identical with those of Geissler, and it seems reasonable, in view of the unanimity of the negative testimony, to disregard entirely the implantation experiments upon which Adamkiewicz bases his theory.

Langenbeck (quoted by Hahn) has succeeded in producing carcinoma of the lung by injecting some cancer juice mixed with blood-serum into the jugular vein of a dog. The nodules were found when the animal was killed two months after the inoculation. Lebert and Toller (quoted by Hahn) injected an emulsion of mammary carcinoma into the jugular vein of a dog, and fourteen days later found some nodules on the pericardium. The rapidity with which the secondary growth occurred was against its cancerous nature. Lanz⁵ implanted a fragment from a col-

¹ Wien. klin. Woch., 1893, No. 37.

² Arbeiten aus der chirurg. Klinik der königlichen Universität zu Berlin, 8te Thiel., Berlin, 1891, p. 70.

³ Wien. med. Woch., 1893, p. 1252.

⁴ Beiträge zur klin. Chir., 1894, vol. xi. p. 321.

⁵ Deutsche medicinische Wochenschrift, 1899, vol. xxv. p. 313.

loid struma into the thyroid gland of a dog, and later the animal died with symptoms of thyroidism, and a fragment of a melanotic sarcoma into a guinea-pig, causing apparently general melanosis of the tissues without tumor formation. On the other hand, numerous inoculations of human carcinomas into animals were without result, for, although the fragments sometimes increased in size for a time, they always ultimately were absorbed. Inoculations of sarcoma and keloid were entirely negative.

Bambeke¹ reported that Firket had made successful inoculations with fragments of human sarcoma into five rats, all of which died at the expiration of five weeks as a result of the development of tumors. Cultures from these tumors remained sterile. The rapidity with which death was caused is strongly against the accuracy of these experiments and the histological examinations of the secondary tumors are not reported. Francotte and Rechter, whose work was reported by Crocq,² inoculated three mice behind the shoulder with cancer juice. Later the foreleg on that side sloughed away as the result of a process of dry gangrene, and there was some tumor formation, fibrous in nature, in the scar. This they regard as cancerous. Crocq is much more skeptical, particularly as the tumor growth was always scirrhus in character, no matter what form of cancer had been used in making the inoculation, and it seems clear that these results cannot be regarded seriously.

Mayet³ has macerated tissue from human beings in glycerin, and with this made repeated inoculations into rats. After some time cachexia developed and the animals died, sometimes with and sometimes without tumor formation. Fragments of carcinoma embedded in tissues were absorbed without lesion. It is singular that so few investigators have used the glycerin emulsions.

The negative evidence, on the other hand, is tremendous. Weigert (quoted by Kubassoff) has made numerous implantations into the muscular tissue, into the peritoneal cavity, and into the subcutaneous tissues of dogs and rabbits with fragments of carcinoma, and the only reaction that was observed was identical with that found when normal tissue was implanted. These experiments are probably the same as those reported by Senger,⁴ who inoculated a number of mice, rabbits, and dogs either intraperitoneally or intramuscularly with fragments of carcinoma. The results were always practically identical, and he therefore describes only a single case. The fragment first increased in size for some time, then gradually diminished, and finally disappeared completely. Histologically, fragments examined at various stages of the process showed central necrosis and atrophy of the cells toward the periphery and invasion of the periphery by fully formed bloodvessels—

¹ *Semaine Médicale*, 1893, p. 8.

² *Ibid.*, 1893, p. 283.

³ *Ibid.*, 1892, p. 482.

⁴ *Berlin. klin. Wochenschrift*, March 5, 1888, p. 185.

that is to say, the ordinary signs of necrosis and absorption. He was unable to obtain any form of micro-organism. Fischel¹ inoculated twenty-three rats intravenously, intraperitoneally, and subcutaneously with sterile fragments of various types of carcinoma and of a small-celled and of a melanotic sarcoma. The fragments all underwent necrosis, and in spite of very careful histological examination no trace of proliferation could be observed. Nevertheless, Fischel does not believe that these results necessarily indicate that carcinomas and sarcomas are not infectious, but only that when transplanted into animals of another species the carcinomatous tissue fails to develop. Wickham² inoculated a number of species of rodents with epithelial cells containing parasites from cases of carcinoma and of Paget's disease, but the results were invariably negative. Klebs³ undertook a series of transplantation experiments with fragments of carcinoma from human beings into white rats, and although the fragments were absorbed, thus giving an opportunity for the liberation of any micro-organisms that may have existed in them, the results were invariably negative. Shattock and Ballance⁴ have inoculated monkeys, cats, rats, and sheep with fragments of carcinomas and sarcomas. These were absorbed or surrounded by the products of inflammation, and although some of the animals were kept alive for 700 days, absolutely no tumor formation occurred. Duplay and Cazin⁵ have performed about 120 experiments upon the transplantation of carcinoma from human beings to the lower animals, using all known methods of inoculation, and failed invariably. Trasbot⁶ for thirty years performed numerous experiments, injecting carcinomatous substances and material into animals, usually dogs, and in all cases except one without result. In this a small tumor developed in the course of a few weeks at the site of inoculation, and then gradually atrophied. Paulowski⁷ has also performed a series of experiments upon the lower animals, such as frogs, rabbits, and dogs, with negative results. D'Anna⁸ has also had negative results from inoculation experiments. Plimmer⁹ is convinced, as a result of numerous experiments, that carcinoma cannot be reproduced in the lower animals. Senn¹⁰ has inoculated dogs with fragments of carcinoma and sarcoma in various ways, but the results were always negative. Török and Tomassoli,¹¹ although they believe molluscum contagiosum to be a contagious disease, have been unable to produce it by inoculation into the lower animals.

¹ Fortschr. der Med., 1892, p. 1.

² Archiv de Med. Exper. et d'Anat. Path., 1890, vol. xi. p. 46.

³ Allgemeine Pathologie, Vienna. 1889.

⁴ British Medical Journal, April, 1891, No. 1576, p. 565.

⁵ Centralblatt f. allg. Path., etc., vol. v. p. 394.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid.

⁹ British Medical Journal, 1899, vol. ii. p. 920.

¹⁰ Pathology and Treatment of Tumors, Philadelphia, 1900, p. 240.

¹¹ Monatschrift f. prakt. Dermatol., 1890, vol. xi. p. 149.

Metschnikoff,¹ some time ago, suggested that perhaps the cancer parasite was obliged to pass through some portion of its life's cycle outside of the living host, and that, therefore, we should endeavor to cultivate it outside the body for a short time before inoculating it. This experiment has been done a number of times. Usually some micro-organism has been obtained which was secured in pure culture, and with it an inoculation performed. This branch of the subject hardly comes under the category of inoculation experiments, but a few of the results obtained by recent workers may be mentioned. Pease² gave an intravenous injection into a guinea-pig of peritoneal fluid from a case of colloid cancer of the peritoneum. This fluid he had withdrawn and kept for ten days in an incubator, and three and one-half weeks after the injection the guinea-pig was killed and a nodule of adenocarcinoma found in the lung. A considerable number of other experiments were negative. Sanquirco³ isolated the bacillus of Scheuerlen from several carcinoma, and inoculated pure cultures into the lower animals, producing sometimes septicæmia and sometimes local infection. Kubassoff⁴ describes a bacillus obtained from a gastric carcinoma that caused tumors in animals when inoculated into or when fed to them. In another series of experiments he obtained the same micro-organism from cancers from three young persons, and they still produced the same results. Unfortunately, no notes are given of the latter group of experiments. The paper is written so carelessly, and, considering the extraordinary importance of the results achieved, the details are so meagre and unsatisfactory, that in the absence of further reports or of any confirmatory evidence whatever, it can, I think, be entirely disregarded. Schoebe contends that the course of the disease in the inoculated animals does not resemble that of adenocarcinoma. More careful work was done by Curtis,⁵ who obtained a yeast from a subcutaneous tumefaction in a man, and was able to produce some infectious growths in the lower animals. After exact histological examinations of these masses he reached the conclusion that they were not tumors, but simply local foci of reactive inflammation and masses of the micro-organisms. Interesting results were also obtained by Mafucci and Sirleo,⁶ who obtained blastomycetes from the body of a marasmic guinea-pig. Inoculated into the lower animals it caused an epitheliomatous ulcer of the skin, with swelling of the lymph-glands. Subsequently the tumor disappeared, but when the animals died miliary nodules were found in the lungs. If large doses were injected there was proliferation of cells of the lymph spaces (endothelioma?).

Sanfelice⁷ describes a blastomycete that he obtained from fruit juices.

¹ Ann. de l'Ins. Pasteur, 1893.

² Public Health Papers and Reports, 1900, vol. xxv.

³ La Riforma Medica, Anno. v., No. 46, p. 272.

⁴ Wien. med. Presse, July 20, 1890, p. 1145.

⁵ Annales de l'Institute Pasteur, 1896, No. 8.

⁶ Centralblatt f. allg. Path., etc., 1895, p. 305.

⁷ Centralblatt f. Bakt. u. Parasitenk. 1895, vol. xvii. p. 625, and 1898, vol. xxiv. p. 155.

He inoculated three dogs and a cock with this, and it produced tumor-like masses, from which he was unable to obtain the micro-organism in cultures. In one case pus from one of the dogs caused tumor formation in one of four others. Lubarsch¹ has repeated these experiments with two cultures of blastomycetes, one obtained from an epithelioma of the lip, the other from Sanfelice through Kral's laboratory. He was unable to produce tumors of any character in guinea-pigs or rabbits. Busse² also criticises Sanfelice's results, chiefly because the nature of the tumors is not clear and the micro-organisms were not obtained from them.³

Plimmer⁴ has recently been able to cultivate the organism described by Ruffer upon a bouillon made of cancer tissue to which 2 per cent. of glucose and 1 per cent. of tartaric acid were added. This belongs to the yeast group, and inoculations produce a distinct proliferation of endothelium upon the serous surfaces of rabbits. In another article⁵ he states that he regards the organism as a protozoon, and describes his inoculations, which in one series of animals caused death in periods of thirteen to twenty days, with the production of small nodules consisting of the proliferating endothelial cells in the serous membrane and in the lung. Up to the present proliferation of the epithelial cells was not observed. Plimmer concludes that certain undoubted parasitic intracellular bodies occur in carcinomas that can be cultivated outside of the body, and will produce tumor formation when inoculated into animals.

Finally comes the group of experiments in which human beings themselves are the subjects. Allebert (quoted by Geissler⁶) inoculated himself and four others with cancer juice, but caused only temporary inflammation. Wickham⁷ inoculated himself with tissue from a case of Paget's disease, but the result was negative. Of course, it has been known for some time that carcinomas might develop in tissues or on raw surfaces from which cancer juice had flowed in the course of operation, and Remcke⁸ observed nodules develop in the wall of the abdomen in the line of puncture made for the withdrawal of ascetic fluid produced by a carcinoma of the peritoneum; and Bergmann (quoted by Hahn) has reported a case of cancer of the lip acquired through contact with cancer of the tongue. Williams (quoted by Kubassoff) has observed a case of inoculation by cancer from one leg to another. Rarer and less well authenticated cases are those in which contagion takes place from one individual to another. Among the most inter-

¹ Zur Lehre von den Geschwulsten und Infektionskrankheiten, Wiesbaden, 1899, p. 313.

² Ergebnisse der allg. Path. u. path. Anat., Lubarsch und Ostertag, fifth year, Wiesbaden, 1900, p. 401.

³ It is hardly fair to Sanfelice to attempt to make a summary of his work from the above articles. His publications on the subject are very numerous.

⁴ British Medical Journal, 1899, vol. i. p. 748.

⁵ The Practitioner, 1899, vol. x. p. 430.

⁶ Loc. cit.

⁷ Loc. cit.

⁸ Virchow's Archiv, vol. li.

esting experiments of this nature are those reported by Hahn and Cornil. Hahn¹ removed fragments from a disseminated carcinoma of the skin and placed them on healthy skin in the same patient. Eleven weeks later these skin grafts had reached the size of cherries. Histologically they resembled the original tumor in all respects. Hahn believes that the infection of healthy skin during operation is possible. Cornil² reported the experiments of a physician whose name he withheld. This surgeon, while amputating a tumor of the breast, inserted a fragment of the tumor into the opposite breast. Two months later a tumor the size of an almond was removed. Cornil examined both specimens, and found that they were identical and consisted of alveolar sarcoma (*sarcome fasciculé*). He believes that there is no doubt that the second tumor arose from the fragments inoculated. The same surgeon performed this experiment in another case, and the clinical course resembled that of the first. Unfortunately, the patient refused to submit to a second operation, and left the hospital with a tumor of the breast of considerable size. The primary tumor was a tubular epithelioma. Of course, it is possible in both these instances that the patients were predisposed to tumor formation. Nevertheless, they demonstrate that fragments of tumor can become incorporated and continue to grow in healthy tissues. Pick³ inoculated the contents of molluscum contagiosum upon a nine-year-old girl and an eleven-year-old boy. At the end of ten weeks a small characteristic lesion appeared in one of the spots of inoculation, and subsequently numerous others also developed. Török and Tomassoli,⁴ however, were unable to reproduce this disease by inoculations into human beings. Lanz⁵ has succeeded in inoculating a group of warts in the form of a J upon the back of his gardener's hand.

In conclusion, I wish to mention two remarkable methods that have been suggested, and one of which has been employed in order to produce cancer. V. Kahlden⁶ states that Klebs has suggested that fragments of the foetus implanted in the placenta might give rise to a malignant tumor—that is, to a diffuse carcinoma of the uterus. V. Kahlden does not believe that this would be the case. Lack,⁷ believing that the epithelial cells are the infectious agents of cancer, has scraped the ovary of a healthy rabbit into its peritoneal cavity. Fourteen months later he states that the animal died of ovarian cancer. In another preliminary communication⁸ he gives a more complete account of the lesions. Numerous hard, white nodules were found on the mesen-

¹ Berlin. klin. Wochenschrift, May 21, 1888, p. 413.

² Semaine Médicale, 1891, p. 259.

³ Archiv. f. Dermatologie u. Syphilis, 1892, p. 89.

⁴ Loc. cit.

⁵ Loc. cit.

⁶ Centralb. f. allg. Path. u. path. Anat., 1891, p. 1.

⁷ British Medical Journal, 1899, vol. ii. p. 179.

⁸ Journal of Pathology and Bacteriology, August, 1899, vol. vi. p. 154.

tery, pleuræ, and diaphragm; the mediastinum was converted into a tumor mass, and the liver contained nodules and cysts. All the "growths consisted of alveolar spaces lined by one or occasionally more layers of columnar epithelial cells." As, according to MacFadyean, the rabbit is not subject to cancer, Lack believes that the "operation produced the disease." It may not be amiss, in this connection, to mention that Schultz¹ has transplanted ovaries to the peritoneal cavities of male guinea-pigs, and at the end of eleven days observed only a moderate atrophy and no trace of proliferation or tumor-like development. Moreover, Lengemann² has made a number of experiments with dislocated tissues and injections of tissues, and Lubarsch³ has performed the same experiments without obtaining any tumor-like proliferations.

An analysis of the work performed by various investigators in this field leads to some conclusions that may not be wholly without value. The transmission of malignant tumors from one animal to another of the same species appears to be definitely established by the work of Hanau, with its subsequent careful histological control by Jenny, by the work of Eiselberg, and particularly by the elaborate experiments of Moreau. On the other hand, the experiments of Wehr, Duplay and Cazin, Geissler, and Smith and Washburn are inconclusive, for the reason that we are not certain that these authors were using in their experiments true tumors, and not, as seems more likely, a form of infectious granuloma that has not yet been recognized as such. The transmission of tumors to the lower animals from human beings may be regarded as absolutely impossible unless some profound modification in technique or in the preparation of the animals subjected to the experiments shall be devised, and at present there is no reason to believe that any modification with which we are likely to become acquainted in the near future will suffice for this purpose. The results are invariably doubtful; not a single positive experiment has been carried out with precautions regarding the histological nature of the growth and its development in the lower animals that would render it worthy of a moment's consideration. There is no reason to believe that cancer tissue introduced into the lower animals acts in any respect differently from any other tissue introduced into the lower animals. It produces the same effects and suffers the same changes. It is hardly necessary to refer here to the discredited experiments of Adamkiewicz. The effects of mediate inoculation are very doubtful. Certainly none of the bacteria that have been described need be regarded as etiologically associated with cancer. On the other hand, there is apparently slightly more evidence

¹ *Centralb. f. allg. Path. u. path. Anat.*, 1900, vol. xi. p. 200.

² *Zur Lehre von den Geschwulsten und Infektionskrankheiten von Lubarsch*, Wiesbaden, 1899, p. 3 et seq.

³ *Ibid.*, p. 246 et seq.

to prove that certain blastomycetes can, under favorable circumstances, produce proliferation of the cells with which they may be in contact, but this proliferation is apparently in the majority of cases endothelial and not epithelial in character. It is a curious fact that Sanfelice has not been able to recover his organisms in culture from the tumors that he alleges they have produced, and it is also singular that the organisms found by Sirleo and Mafucci and by Sanfelice were obtained not from tumors, either in human beings or the lower animals, but in one case from a cachectic guinea-pig and in the other from juices of decaying fruit. It was to be expected that the transmission of cancers from one human being to another would be successful in view of the successes of similar transmissions in the lower animals. Aside from the reports of Cornil and of Hahn, however, even this experiment appears to have failed. The negative results, at any rate, at present certainly outweigh the positive results. It is to be noted, moreover, that in the reports of Cornil and of Hahn the tumors were transferred only to other supposedly healthy parts of the same individual. The experiment of Lanz with cutaneous warts was very decisive, but we are still rather doubtful regarding the nature of these growths.

It will perhaps not be out of place to suggest in what direction subsequent investigation upon the subject of the etiology of malignant neoplasm should apparently be pursued. It seems useless to continue inoculating lower animals with fragments of human cancers; it is criminal to use human beings as subjects for these experiments, and we are, therefore, restricted to inoculation experiments with such malignant tumors as may develop spontaneously in the lower animals. These tumors are not uncommon in dogs, and probably are more frequent than is ordinarily supposed in the ordinary laboratory animals. It is urgently necessary that a number of investigators undertake the elucidation of this subject and determine under what conditions and by what methods the transmission of the tumor actually takes place. In regard to mediate inoculation—that is, the study of the tumors with reference to the presence of parasites—it does not seem that at present we are sufficiently familiar with the blastomycetes or with the lesions that they produce in animals to reach any positive conclusion. It is very necessary, therefore, that the blastomycetes be studied from a botanical stand-point, and that the lesions produced be more carefully described. As for coccidia or protozoa, Schaudinn,¹ one of the keenest workers in this field, has recently stated that from a careful examination of sections of one hundred malignant growths in which the so-called cancer parasites were present he was convinced that the growths did not contain any bodies that could be regarded as coccidia or protozoa.

¹ *Zoolog. Jahr. Abth. f. Anat. u. Ontolog. der Thieren.*, 1900, vol. xiii. p. 197.

REVIEWS.

ON NEUROMA AND NEURO-FIBROMATOSIS. By ALEXIS THOMSON.
Edinburgh: Turnbull & Spears, 1900.

THIS is an admirable monograph, and may be read with profit by those interested in the fibrous overgrowth in nerves. Thomson has had a remarkable experience in the observation of fifteen cases. He includes under the fibrous proliferation of nerves the multiple neuro-fibromata, the plexiform neuro-fibromata, the cutaneous neuro-fibromata, elephantiasis neuromatosa, the pigmentation of skin associated with neuro-fibromatosis, and secondary malignant neuroma—*i. e.*, sarcomatous transformation in any of the forms of neuro-fibromatosis. This seems to be a perfectly proper classification in the light of recent studies.

It must be borne in mind that the term neuroma when used in the clinical sense is made by some to include tumors of various kinds, whatever their structure may be; the existence of true neuromata, however, Thomson believes, can no longer be denied. These tumors are exceedingly rare, especially if we exclude stump neuromata. The latter are true neuromata, as anyone may convince himself by examining with the microscope a tumor of this character. It is wise to devote a few words to the true neuromata, because many pathologists still question the existence of such growths. Thomson refers to five authenticated cases of true neuromata in which the tumor or tumors were composed of newly-formed ganglion cells and of medullated and non-medullated nerve fibres. In all these cases, with one doubtful exception, the true neuromata were in connection with the sympathetic nervous system. It is noteworthy that these true neuromata do not appear to be combined with any of the forms of neuro-fibromatosis. The five cases referred to by Thomson are those reported by Knauss, Busse, Schmidt, Loretz, and Key. Thomson makes no reference to the disputed cases of true neuromata of the spinal cord in the literature. A few cases of this character have created much contention in regard to the correct interpretation of the findings.

Thomson believes that the circumscribed or solitary tumors growing from the connective tissue of nerves constitute a distinct and separate class of false neuromata. In the opinion of the reviewer this view is not well sustained. While transition forms between the solitary tumor and general neuro-fibromatosis are not incompatible with the differentiation into different classes, they nevertheless weaken this differentiation in proportion to their frequency of occurrence. Again, the discovery of one or more tumors is no evidence whatever that latent growths are not present in other nerves, and Thomson himself refers to the facts that neuro-fibromatosis has been discovered more than once on post-mortem examination when its existence was entirely unsuspected during life,

and that even an extensive neuro-fibromatosis may be unattended by any symptoms. How can anyone assert without a necropsy that a visible neuro-fibroma is the only change in the fibrous tissue of the same or other nerves?

Thomson knows of no authentic observation of the occurrence of degeneration of nerve fibres in any case of innocent solitary neuroma; he thinks, however, he has found degenerative changes in two cases of multiple neuro-fibromata. It is always difficult to decide this question, because the overgrowth of connective tissue separates the nerve fibres from one another, and in this way gives an incorrect idea of extensive destruction of nerve tissue. Making all due allowance for this fact, the reviewer believes that he also has observed degeneration of nerve fibres in multiple fibro-neuromata. Malignant tumors of nerves unquestionably cause destruction of nerve fibres.

Sarcomata of the sciatic nerve demand surgical treatment, and it is well to bear in mind some facts stated by Thomson. Recovery of function after the removal of the tumor has been usually remarkably good, but recurrence of the tumor has been the rule, and death from internal metastases has occurred in the majority of these cases. Thomson, therefore, concludes that although removal of the tumor alone has been successful in a very small proportion of cases of malignant neuroma, the best and usually the only chance lies in the early and high amputation; the rationale of this treatment being that we have to deal with a sarcoma which spreads upward along the interior of the affected nerve. Where amputation cannot be done division of the nerve above the tumor may relieve pain, or even division below the tumor may be desirable if the nerve cannot be cut higher. It is difficult to believe that much benefit can be obtained by cutting a nerve below the tumor. A rapidly growing neoplasm of a nerve will cause pain even though peripheral irritation has been cut off. Every physician knows of *anæsthesia dolorosa*. The sarcomatous degeneration of fibro-neuromata is peculiar in that it is not liable to cause visceral metastasis, but is liable to cause the sarcomatous change in neuro-fibromata of other parts of the body. We fear that Thomson's advice in regard to the treatment of new growths in nerves will not be invariably followed. The high amputation for the removal of a small malignant tumor of the sciatic might seem to some too heroic.

Thomson knows of no reliable facts in regard to the occurrence of sarcomata in the ganglionic enlargement of nerves. In reference to this we may mention that a few cases of endothelioma of the Gasserian ganglion have been described (Homén, Hagelstam, Dercum, Keen and Spiller.)

It seems curious that the fibromatosis of nerves does not extend to the membranes of the brain and spinal cord, as these are regarded as homologous with the sheaths of nerves, and yet involvement of the central nervous system in fibromatosis has never been observed. The central nervous system is, therefore, not considered in treatises on neuro-fibromatosis.

The treatment of neuro-fibromata showing no malignant change demands a few words in this review. Removal of one or more neuro-fibromata has been followed in some cases by greater activity and a generalization of the fibromatosis. The important question is, therefore, in regard to the treatment of these tumors. Thomson believes

that where the pain is agonizing it may be necessary to disregard the dangers attending removal, although it might be wiser to resect a portion of the nerve at a higher level or to amputate a limb. This advice requires careful consideration, because sarcoma seems to develop in neuro-fibromatosis in over 17 per cent. of the total cases recorded, and Thomson gives the detailed histories of two of his cases in which sarcomatous degeneration developed after removal of some of the neuro-fibromata. This form of degeneration seems to be exceptional in the plexiform tumors. The surgeon may well hesitate to cause paralysis by excising a portion of a nerve the seat of a few neuro-fibromata, and his hesitation may be much greater when he takes into consideration the question of amputation of a part or the whole of a limb. The patient in many instances will certainly object to an operation which appears to him unnecessarily severe, but sarcomatous degeneration in over 17 per cent. of cases of neuro-fibromatosis is not to be disregarded.

Bruns collected the records of forty-two cases of plexiform neuro-fibromata, but the number of reported cases as given by Thomson is sixty-two.

The illustrations used in this monograph are excellent. Most of them are from the author's own cases, but a few have been borrowed from other writers. The printing and binding are very good, except that in the copy before us several pages have been duplicated—a trifling fault, but one that causes annoyance until the cause of the confusion is recognized.

W. G. S.

CONTRIBUTIONS FROM THE WILLIAM PEPPER LABORATORY OF CLINICAL MEDICINE. Published on the Phœbe A. Hearst Foundation. Philadelphia, 1900.

THIS is a noteworthy volume of 479 pages, representing thirteen distinct contributions to scientific medicine from the Pepper Laboratory of Clinical Medicine of the University of Pennsylvania. The volume, which is well edited and well illustrated, is issued in commemoration of the founder of the laboratory, the late William Pepper, an excellent likeness of whom fittingly forms the frontispiece. Surely the workers indebted to his wise provisions for the opportunity to pursue special studies could have selected no more appropriate method of testifying in a lasting form to their gratitude for his high generosity, "For, unlike any tribute wrought in stone or metal, it has the quality of increase. The results of the investigations here set forth will stimulate further investigations and lead to still greater increase of knowledge."¹

The year 1900 is to be a distinguished year in American medicine, because it marks the inauguration on a large scale of the publication of memorial volumes, as shown by the appearance, simultaneously with the volume forming the subject of this notice, of the volume published by the pupils and friends of Prof. Welch in Baltimore in honor of the twenty-fifth year of his doctorate, and of the *International Contributions*

¹ From Dr. Councilman's address on the occasion of the presentation of the Welch "Festschrift."

to *Medicine*, in commemoration of Abraham Jacobi's seventieth birthday. Certainly, these three books, in contents, form, and objects, immediate and remote, compare favorably with publications of similar character in other countries. It is, we believe, a matter of congratulation that the time and opportunity are at hand for undertakings of this nature. The general effect can but be widely stimulating and helpful. The productiveness, originality, and resources of scientific medicine in this country are brought out well in all these volumes, and in no inferior degree in the volume under consideration, which represents the industry and achievements of but a single laboratory, and that of rather special scope. That the establishment of this laboratory has materially advanced the cause of scientific investigation in medicine in this country is shown clearly by the contributions in this volume, all of which present the results of original research.

The varied nature and general character of the contents of the volume are best indicated by giving the titles of the various articles:

Two Cases of Muscular Dystrophy, with Necropsy, by William G. Spiller, pp. 17-62. A Case of Amyotrophic Lateral Sclerosis in which Degeneration was Traced from the Cerebral Cortex to the Muscles, by William G. Spiller, pp. 63-106. A Contribution to the Study of (a) Iron Infiltration in the Ganglion Cells; (b) Forced Movements Due to Cellular Degeneration of the Cerebellum following Rattlesnake Poisoning, by D. J. McCarthy, pp. 107-119. A Fatal Case of Sulphonal Poisoning, by Alonzo Engelbert Taylor and Joseph Sailer, pp. 120-128. Melanotic Sarcoma of the Spinal Cord, by Joseph Sailer, pp. 129-147. Studies in Leukæmia, by Alonzo Engelbert Taylor, pp. 148-328. On the Pathology of the Erythrocyte, by Alfred Stengel, pp. 329-555. The Restitution of the Blood Plasma following Intravenous Saline Injection after Hemorrhage, by A. E. Taylor and C. H. Frazier, pp. 356-367. The Influence of Immoderate Water-drinking upon Metabolism and Absorption, by D. L. Edsall, pp. 368-394. An Experimental Study of the Etiology of Appendicitis, by Charles H. Frazier, pp. 395-415. Primary Endothelioma of the Left Superior Pulmonary Vein, by Joseph Sailer, pp. 416-446. A Clinical Method for the Estimation of Breast-milk Proteids, by George Woodward, pp. 447-449. The Etiology of Pertussis; the Bacillus of Czaplewski-Henzel, by Joseph Walsh, pp. 450-474. Previous Contributions from the Laboratory, pp. 475-479.

Each article is a valuable and interesting contribution to the subject with which it deals. It is probably not invidious to mention the exhaustive reports of cases of muscular dystrophy and amyotrophic lateral sclerosis by the industrious Spiller; the extensive and deep study of leukæmia by Taylor, and the concise and able presentation of the pathology of the erythrocyte by Stengel. Sailer's cases of melanoma of the spinal cord and of primary endothelioma of the left superior pulmonary vein are quite unique and of great interest. Frazier brings a valuable addition to an important but hitherto somewhat neglected phase of appendicitis, namely, the experimental study of its etiology. Walsh shows that the bacillus of Czaplewsky-Hensel, the organism that seems to be associated more closely with pertussis than any of the other numerous organisms reported in connection with this disease, probably belongs in the so-called pseudodiphtheria group; and the results of his injections with the serum of persons having had whoop-

ing-cough are certainly calculated to engage further attention. The more purely chemical and experimental physiological work of the laboratory is well represented by the articles of Woodward, Edsall, and Taylor and Frazier.

The list of previous contributions from the laboratory contains more than sixty articles by twelve different authors—a record that, taken in conjunction with the *Pepper Memorial Volume*, speaks of great activity since the inauguration of the laboratory, in 1895, “to encourage the prosecution of minute clinical studies and original researches, and to advance the interests of science by the publication of the results of such work.”

L. H.

PRECIS DE TOXICOLOGIE. CLINIQUE ET MEDICO-LEGALE. Par le DR. VIBERT. Paris: J. B. Bailliere et Fils, 1900.

SYNOPSIS OF TOXICOLOGY. CLINICAL AND MEDICAL LEGAL.

THE study of toxicology in the broadest sense has become one of great interest on account of the relations of the ordinary forms of intoxication with infections. The analogy of the conditions in the former and latter have led to certain valuable discoveries, and the methods of investigation pursued in the case of ordinary poisons have been carried out with bacterial intoxications with satisfactory results. The present work, however, is not an attempt at constructing any general scheme or of establishing a comprehensive system of toxicology; it deals rather with the classification of poisons, the discussion of their general action, and some consideration of special forms of intoxication. The author very wisely excludes all consideration of chemical methods, as these are of interest only to practical chemists. Considerable attention is given to the pathological lesions caused in experimental intoxication and the lesions discovered post-mortem in cases of poisoning. Regarding the classification, he advocates the eventual separation of groups representing certain definite forms of action. These groups may be separated according to the tissues which they especially attack and according to the kind of change that they induce. Experimental toxicology has already made it possible to establish some of these groups, as, for example, the poisons of the blood and the toxalbumins. The poisons of the nervous system, including cardiac poisons, would form another group; and still another would include such toxic substances as attack the cellular nutrition, like phosphorus. Unfortunately there are many poisons which cannot be placed in any one of the groups, because their action is insufficiently known, and because in other cases the intoxicant exercises different forms of action, and the relative importance of the different kinds of activity cannot as yet be properly estimated. A similar classification has been adopted by others. One which has seemed to us to be particularly useful divides the poisons into (1) corrosive; (2) parenchyma poisons; (3) blood poisons, and (4) nerve poisons. It is to be observed, however, that the poisons which are corrosive in certain strengths are parenchyma poisons when more slowly administered and in smaller dose, and some of the bodies which are blood poisons also produce changes in the fixed organs. It is unnecessary to

review at length the chapters dealing with the individual poisons. These are written with particular care for the needs of the clinician. The concluding chapters of the book, dealing with the toxalbumins, ricin, and abrin, the venom of serpents, the poisoning with mushrooms and tainted food, are all of particular interest.

Altogether the book is a useful synopsis for the practitioner, all the more as it details the treatment of the various forms of poisoning with particular care.

A. S.

DISEASES OF THE NOSE AND THROAT. By J. PRICE-BROWN, M.D., L.R.C.P.E., Member of the College of Physicians and Surgeons of Ontario; Laryngologist to the Toronto Western Hospital; Laryngologist to the Protestant Orphans' Home; Fellow of the American Laryngological, Rhinological, and Otological Society; Member of the British Medical Association, Pan-American Medical Congress, the Canadian Medical Association, the Ontario Medical Association, etc. Illustrated with 159 engravings, including six full-page color plates and nine colored cuts in the text, many of them original. Pp. xvi., 470. Philadelphia: The F. A. Davis Co., 1900.

THE author, in apologizing for adding yet one more to the numerous text-books on the subject, states that his work is intended for the medical student and the practitioner who is obliged to do more or less nose and throat work in the daily routine of general practice. The book is well adapted for these purposes, although the author has, he says advisedly, left out altogether the consideration of some subjects which may be regarded as occupying the borderland between laryngology and general medicine, such as diphtheria and asthma, and about which, one can but feel, the average medical man might well need some advice from the specialist. It is also to be regretted that Dr. Price-Brown has seen fit to devote such a very small amount of space to the anatomy and physiology of the nose and throat. It is true these matters can be looked up in text-books on anatomy, but in these books they are not given in such a way as to bear on some of the practical points which can be emphasized only by considering them in their clinical bearing. His discussion of the pathology and symptomatology of the morbid conditions met with in the nose and throat is sufficient for practical purposes, though concise in many particulars. The sections devoted to the treatment of morbid conditions of the upper air-passages are uniformly good. The author writes in a terse but very attractive way, and in describing methods of treatment he has chosen those which can be most readily carried out by the practitioner. In describing operative measures he occasionally has made his descriptions somewhat too brief to be altogether lucid, but it is unlikely that any save the specialist would undertake the operations to which this criticism applies. An innovation is the use of the metric system in the various prescriptions given throughout the book. Fortunately, however, for the average reader a translation of the prescription into the ordinary system is given at the foot of the page, so that he can understand it.

The illustrations are—many of them—taken from standard works, such as Lennox Browne and Bosworth, but they are interspersed with

a considerable number of original ones of real merit, particularly some colored plates of frozen sections. The typography of the book is all that could be desired.

F. R. P.

THE YEAR-BOOK OF THE NOSE, THROAT AND EAR. The Nose and Throat, edited by G. P. HEAD. The Ear, edited by ALBERT H. ANDREWS Pp. 274. Chicago, Illinois: Chicago Medical Book Co., 1900.

WORKS of this kind are of the greatest value, particularly since the *Index Medicus* is no longer published. The editors have given abstracts of most of the leading articles on laryngology and otology which have appeared, both in this country and Europe, during the year. The abstracts are judiciously made, sufficient of the original article being retained to illustrate its trend. The work does not pretend to be a complete list of all of the literature of the subject, but is very good so far as it goes. It is to be hoped the editors will feel sufficiently encouraged to continue their labors, as they will surely meet with the due appreciation of the members of the profession who are interested in the specialties with which they deal. The book is a handy volume, clearly printed, and reflecting credit on the publishers.

F. R. P.

BACTERIA: ESPECIALLY AS THEY ARE RELATED TO THE ECONOMY OF NATURE, TO INDUSTRIAL PROCESSES AND TO THE PUBLIC HEALTH. By GEORGE NEWMAN, M.D., F.R.S. (Edin.), D.P.H. (Camb.), etc., Demonstrator of Bacteriology in King's College, London. The Science Series. New York: G. P. Putnam's Sons. London: John Murray, 1899.

THE scope of the work is indicated in the title and in the following extract from the preface: "The present volume is not a record of original work, nor is it a text-book for the laboratory. . . . It is an attempt, in response to the editor of the series, to set forth a popular scientific statement of our present knowledge of bacteria." Books of this character serve a useful purpose, and the one before us contains a store of valuable knowledge which is presented in an attractive manner. Our constant dependence on the functional activity of germs in many of the ordinary pursuits of life has been well brought out, and the author is to be especially commended for the picture he has given of microbes as the friends and allies of mankind rather than as their enemies. The part played by them in the purification of sewage, and the removal of dead organic matter by its conversion into forms easily assimilated by plants as food, through the process of "nitrification" is well described, while the account of sewage treatment by the "septic tank and cultivation beds," which has been in use in England for several years, is particularly interesting.

The chapter on Milk, Milk Products, and Other Foods gives a comprehensive review of modern dairy methods, including the use of pure culture "starters." The author speaks with approval of the addition

of preservatives, such as boric acid, salicylic acid, and formaldehyde, to milk, a practice entirely discountenanced by physicians in America. It has been abundantly demonstrated that with reasonable care milk can be drawn clean and preserved by cold alone for considerable periods of time.

The chapter on Disinfection contains no mention of "milk of lime," which is justly regarded as one of the cheapest, safest, most efficient and easily obtained disinfectants known, and especially valuable for household use.

While the book contains much that the physician can read with profit, it is more suitable for the general reader, for whom it is evidently intended.

The book is marred by numerous errors, the nature of which indicates that the proof was read by someone other than the writer, and who had no technical knowledge of the subject, and also in several places by a looseness of expression and confusion of terms, for which the author must be held accountable. Such errors are particularly objectionable in a work of this nature, designed to be read by those having no special knowledge of the science and who are, therefore, unable to detect the mistakes. Many of the illustrations are unusually good, notably the micro-photographs, but several of the cuts are inexcusably poor, detracting from both the appearance as well as the value of the book. The binding and printing are excellent. M. P. R.

GYNECOLOGY: A MANUAL FOR STUDENTS AND PRACTITIONERS. By MONTGOMERY A. CROCKETT, M.D., Adjunct Professor of Obstetrics and Clinical Gynecology, Medical Department University of Buffalo; Attending Gynecologist to the Buffalo General and Erie County Hospitals. Edited by B. B. GALLAUDET, M.D., Demonstrator of Anatomy and Instructor in Surgery, College of Physicians and Surgeons, Columbia University, New York; Visiting Surgeon, Bellevue Hospital. New York and Philadelphia: Lea Brothers & Co., 1900.

THE book has so many good points that it is a pity that the author did not restrict himself somewhat more closely in his range of subjects. No book of 351 pages can do justice to Gynecology in its entirety if anything more comprehensive than a syllabus is attempted.

It would have been much better if all technique of major operative procedures had been omitted, and in the space thus gained a more detailed account of operations possible to the general practitioner had been substituted.

Certain statements strike one as entirely too dogmatic, as for instance the absolute interdiction of the use of silk ligatures within the abdominal cavity, while the use of the stem pessary is at least not a form of treatment to be recommended without a more detailed warning of its danger.

The book will well repay one for the time spent in its reading, however, the main fault with it being that the author has attempted to include too much material in the space at his command.

W. R. N.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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On the Cultivation of Typhoid Bacilli from Rose-spots.—RICHARDSON (*The Philadelphia Medical Journal*, March 3, 1900, p. 514) points out the scientific and diagnostic value of the rose-spots in typhoid fever as determined by recent research. That the rose-spots are due to a metastasis of the typhoid bacilli from the intestine to the skin has been frequently demonstrated since the discovery of the typhoid bacillus by Eberth. In investigating this point, however, many negative results had been obtained.

Neufeld has recently reviewed the subject and gives some remarkable results obtained by himself. He found that the efforts to cultivate the typhoid bacillus from the rose-spots had hitherto been so often negative that they had little value either from a scientific or from a diagnostic stand-point. Neufeld's results, however, have been extraordinary in that he cultivated the typhoid bacillus in thirteen out of fourteen cases. He attributes his good results to the fact that he as quickly as possible transferred the drop of blood from the rose-spot to a tube of nutrient bouillon. In this way he was able to dilute the bactericidal substances of the blood so thoroughly and quickly that they no longer destroyed the typhoid bacilli, as they do when cultures are taken in the ordinary way. To the lack of observance of this method of technique Neufeld attributed the frequent negative results of previous workers.

Neufeld compared the date of the earliest appearance of the Widal reaction with the earliest day of the disease on which he had obtained the typhoid bacillus from the rose-spots. This was done in eight cases, and he found that in seven out of the eight cases the diagnosis made from the rose-spots was, on an average, six days ahead of that made by the Widal test, whereas in only one case was the Widal reaction obtained first.

Curschmann, stimulated by Neufeld's work, undertook a similar investigation, also, with remarkable results. He found the typhoid bacillus in fourteen out of twenty cases examined bacteriologically.

Richardson made a bacteriological examination of the rose-spots in six cases, using the same technique as Neufeld, with the exception that the rose-spot was frozen with a spray of methyl chloride before it was incised. He obtained the typhoid bacillus in five of the six cases. In all the cases the positive result of the cultures from the spots antedated the Widal test by an average of six days. His work confirms a further point ascertained by Neufeld, namely, that not every spot can be depended on to yield bacilli. Five or six spots should be incised in every case.

Concentration of the Urine and Blood in Kidney Diseases, and the Cause of Uræmia.—LINDEMANN (*Deutsches Archiv für klinische Medizin*, Band 65, p. 1) has an article on this subject giving the results of a large number of examinations in various diseases. As a result of these examinations he came to the following conclusions:

1. The concentration of urine can be determined with great accuracy by means of the freezing-point method. This method is superior to others for determining the concentration, such as specific gravity and the dry residue, as it does not depend on the weight of the single constituents, but only on their molecular number. Such a determination permits a conclusion as to the functional capacity of the kidneys.

2. The determination of the lowering of the freezing-point of urine, along with the measurement of the daily excretion, allows one to distinguish between albuminuria independent of inflammation in the kidney from that caused by nephritis.

3. The freezing-point of normal urine—moderate quantities being passed—varies between -1.30 and -2.30 , and variations as great as -0.90 and -2.73 are very unusual.

4. The lowering of the freezing-point in all inflammations of the kidney, and along with that the concentration, is much less; with moderate daily quantities the freezing-point is usually less than -1 .

5. The lowering of the freezing-point shows characteristic differences between parenchymatous and interstitial nephritides; in the former the lessened concentration is more marked, and is especially so with small quantities of urine.

6. The lessened concentration is often such that the urine shows a lower freezing-point than normal blood-serum.

7. The determination of the concentration of urine does not permit one to distinguish between an acute and chronic parenchymatous nephritis, but it enables one to recognize oncoming recovery by the approach of the freezing-point to normal.

8. The lowering of the freezing-point allows one often to recognize the transition of chronic parenchymatous nephritis into secondary contracted kidney; it then increases and reaches values similar to those in primary contracted kidney.

9. Other albuminurias, such as those in congested kidney, in fever, in cystitis, and pyelitis are characterized by the absence of a lessening of the reduc-

tion of the freezing-point. Exception must be made in cases of collapse, in which small quantities of urine are passed with lowering of concentration.

10. In cystitis and pyelitis a lessening of the concentration with moderate quantities of urine indicates the extension of the inflammation into the renal tissues with great probability.

11. The estimation of the total quantity of the substances excreted with the urine in nephritis frequently permits a conclusion as to retention of other substances that should be excreted.

The author has also applied his observations to the theory of uræmia, and with reference to this makes the following conclusions:

1. In nephritis the concentration of the blood-serum is normal as long as there are no uræmic symptoms.

2. When uræmia occurs there is a concentration of the blood-serum, and its osmotic pressure is increased. The lessening of the freezing-point sometimes amounts to as much as -0.70 .

3. This elevation of osmotic pressure is the general expression of the existing abnormality in the uræmia, and most of the changes found in uræmia can be sufficiently explained by it.

4. The phenomena which appear after injections of large quantities of concentrated salt solution in the circulation are the same as those that occur in uræmia; they appear with the increased concentration of the blood when the elimination of accumulated substances from the blood can no longer go on because the absorptive power of the tissues and organs is exhausted.

Venous Thrombosis as a Complication of Cardiac Disease.—WELCH (*Festschrift in Honor of Abraham Jacobi*, p. 461) reports four cases of thrombosis of the peripheral veins complicating cardiac disease, and gives abstracts of twenty-three other cases which he has been able to collect from the literature. Only cases with thrombosis of the peripheral veins are included.

Dr. Welch summarizes the four cases as follows:

CASE I.—Aortic and mitral insufficiency. Adherent pericardium; broken compensation; thrombosis of the left innominate, jugular, subclavian, and axillary veins. Death.

CASE II.—Mitral stenosis. Thrombosis of the left jugular, axillary, subclavian, and innominate veins; embolism of the left popliteal artery. Recovery from effects of vascular occlusion.

CASE III.—Mitral and aortic insufficiency. General anasarca; thrombosis of the left axillary and brachial veins. Death.

CASE IV.—Mitral insufficiency. Thrombosis of the left femoral vein. Recovery from the effects of the thrombosis.

These four cases, with the twenty-three collected from the literature, make a total of twenty-seven cases of thrombosis of the peripheral veins complicating cardiac disease.

The most remarkable feature of the series is the location of the thrombi. Twenty-three were thromboses of veins supplying the upper extremities or the neck, or both, mostly of the left side, and only four were thromboses of veins supplying the lower extremities. This ratio is remarkable when one considers that Bouchut's statistics show that the ratio of venous thrombosis of the upper extremity is to those of the lower as one is to fifty. The four

instances of venous thrombosis of the lower extremities had little in common with the remaining twenty-three. Two were in old persons with some arterial atheroma. The thrombosis was on the left side in three and bilateral in one, thus conforming to the general rule. The remaining twenty-three cases of venous thromboses of the neck and arms in cardiac disease constitute a separate and distinct group characterized by features of special interest.

Seventeen cases were in females, four in males, and of two the sex was not stated. These figures show that this form of thrombosis is especially frequent in females. Attention in this connection is drawn to the fact that mitral stenosis is particularly common in women between the ages in which these cases occurred.

Of the 17 patients with thromboses of the neck and arms whose ages were stated one-half, or 8, were between fifteen and thirty years of age. The youngest was nine and the oldest fifty-two.

In 2 cases the valvular lesion was not stated. Of the remaining 21 cases there was organic disease of the mitral valve in 20; in the other case there was aortic insufficiency, with relative mitral incompetence. Of the mitral lesions, mitral stenosis, with or without insufficiency, took the lead.

The valvular lesion was caused by rheumatism in a little over one-half of the cases. In a great majority of the cases the thrombosis appeared during a condition of broken compensation.

As to the location of the thrombi, the striking feature is that in 21 out of the 23 cases the veins of the left side were involved; of these 14 were unilateral and 7 bilateral. In only 2 cases were the veins of the right side alone affected. The commonest starting-point for the thrombus was the lowest part of the left internal jugular, or of the left internal jugular vein and the left innominate or subclavian vein near the entrance of the jugulars.

The thrombi were mixed, the prevailing color being dark red. In a few instances the thrombus was centrally softened. Bacteria were searched for in only three cases and were found only in Welch's first case, the organism being the streptococcus pyogenes.

The local symptoms were those usually associated with venous thrombosis—pain, tenderness, œdema, the presence of hard, sensitive venous cords, and distention of the superficial veins.

The prognosis in these cases is grave. Of the 23 cases 19 ended fatally and 4 recovered. The gravity of the prognosis apparently results mainly from the circumstance that the occurrence of the thrombosis is in itself an index of extreme failure of compensation of the valvular lesion, being sometimes scarcely more than a terminal event.

Although five of the cases were reported as instances of rheumatic phlebitis, Welch doubts whether rheumatism was the correct explanation given in these cases. In the whole series he thinks that rheumatism had only a minor share in the immediate causation of the thrombosis. French writers, particularly Peter, Parmentier, Kahn, and Huchard, hold that the underlying cause is some alteration in the chemical composition of the blood similar to the changes in the blood which are held to cause the thromboses in tuberculosis and cancer.

The explanation of the greater frequency of thrombosis of the veins of

the left upper extremity is based by most observers on anatomical lines. The return of the venous blood from the left upper extremity is more difficult than the right, owing to the greater length and obliquity of the left innominate vein. Welch suggests also the effect of pressure, either direct or indirect, on the left subclavian vein from the dilated left auricle and dilated large pulmonary vessels.

The frequency with which the thrombus starts from the lower ends of the jugulars is explained by von Recklinghausen as being due to the whirling or eddying movement (*Wirbelbewegung*) of the blood at this point. This whirling movement is due to local anatomical causes. Welch strongly supports the theory.

The writer lays great stress on the view that the thrombi are bacterial in origin. This view is supported by the results of bacteriological examinations made of thrombi in the author's laboratory. Of forty-four thrombi examined the cultures showed micro-organisms in thirty-four. Welch thinks that the bacterial theory of causation is the most satisfactory for the present.

An Analysis of Sandy Matter (Sable Intestinal) from the Human Intestine, with Special Reference to a Contained Pigment of Unusual Character.—THOMSON and FERGUSON (*The Journal of Pathology and Bacteriology*, February, 1900, vol. vi. p. 334) give the results of their analyses of the so-called intestinal sand passed in the stools of a female patient, aged thirty years. The patient had for years suffered at intervals from symptoms of catarrh and dilatation of the stomach, associated at times with signs of decided neurosis. Just after one of the attacks it was noticed that the movements contained sandy matter. The diet during this time was limited to milk and lime-water. Three samples of sandy matter were obtained. The first of the samples obtained weighed about half an ounce; the second and third about six drachms each.

Collected at the bottom of a vessel the sediment presented a somewhat brownish-yellow appearance strongly suggestive of uric acid, and even when examined microscopically in the moist state the resemblance to uric acid was very striking. An application of the murexide test gave negative results, and no gas was evolved when the sand was treated with sodic hypobromite. The sand was evidently not of vegetable origin, as there was no trace of sclerenchymatous tissue in any of the samples examined microscopically.

A chemical analysis of the sand showed it to contain 71.5 per cent. of inorganic and 28.5 per cent. of organic matter. A further analysis of the inorganic matter gave 11.5 per cent. calcic carbonate, 87.3 per cent. of tricalcic phosphate, and 1 per cent. of insoluble residue (silica.)

Thomson and Ferguson made some careful studies of the nature of the pigment contained in the sand. As a result of their studies they were led to conclude that the pigment was not one of those usually described as derived from the normal pigments of the bile. Its insolubility in chloroform, ethylic alcohol, and ether excluded bilirubin, bileverdin, bilifuchin, bilifrasin, stercobilin, and cholehæmatin; while its solubility in dilute acids excluded bilihumin (Stadeler).

They further concluded that the intestinal sand, from its ready solubility

in dilute acids, was formed neither in the upper part of the small intestine, where practically unchanged bile-pigments are present, nor in any part of the colon, in which stercobilin is the prevailing pigment, but in the ileum, where the intestinal contents are most likely to be alkaline in reaction. They think that the contained pigment is most probably a substance intermediate between the ordinary bile-pigments and their ultimate product—stercobilin.

A Case of Typhoid Infection without Intestinal Lesions, with Positive Widal Reaction.—OPHÜLS (*New York Medical Journal*, May 12, 1900, p. 728) adds another instance to the gradually increasing number of cases that have been reported of typhoid fever without intestinal lesions.

The patient, a man, twenty four-years of age, came under observation on September 4, 1899. He was unconscious, and no definite history could be obtained. The urine gave the diazo reaction. The Widal test was positive, with a dilution of 1 to 40. There was marked abdominal tympany. The left lung gave impaired resonance throughout, and there were râles over both bases. The patient's temperature ranged between 100° and 106° F. He was treated by calomel, stimulants, and cold baths. Death occurred on September 11th.

An autopsy was obtained and the following anatomical diagnosis was made: Typhoid infection without intestinal lesions; necrotizing bronchopneumonia, with recent pleuritis. Inflammatory softening of the spleen, enlargement and multiple necroses in the lymph-glands at the base of the mesentery; cloudy swelling of the kidneys and pancreas; multiple necroses in the liver; acute inflammation of the appendix; multiple hemorrhages on mucous membrane, the bladder, and renal pelves; cyanosis; œdema under the eyes.

Cultures from the spleen gave the typhoid bacillus, which was agglutinated by the serum from a case of typhoid fever with a dilution of 1 to 40. The colon bacillus was obtained from the spleen, as well as from the kidneys, liver, and lungs.

According to Ophüls, the view that typhoid fever could occur without intestinal lesions was held even before the Eberth-Gaffky bacillus had been discovered—that is, before it was possible to identify these cases positively as typhoid fever. Andral seems to have been the first to call attention to this fact. Similar observations were recorded by Brunschwig, Litten, Moore, Church, Coupland, and Goodall. Most authors agree that the first really convincing observation supported by bacteriological proof was made by du Cazal in 1893. Ophüls claims that of all the cases reported as typhoid infection without intestinal lesions there are only five—that of Flexner and Harris, the three of Lartigau, and his own—in which the differential characteristics between the typhoid bacillus and allied forms have been sufficiently carefully followed out to allow of a definite statement that these cases were actually typhoid infection.

The writer discusses the probable mode of entrance into the system of the typhoid bacilli in these cases. Several of those who have reported such cases hold that the respiratory tract or the bile-ducts or gall-bladder have been the entrance. While admitting this possibility, Ophüls seems to be strongly of opinion that notwithstanding the absence of gross intestinal lesions

at autopsy, the intestinal mucosa has probably been the point of entrance of the organism into the system. He thinks that the enlargement of the mesenteric lymph-glands found in several of the reported cases, including his own, is very suggestive in this regard. He seems inclined to the view that in typhoid fever the intestinal lymphatic tissue may undergo hyperplasia and resolution without ulceration, and believes that in some of the cases reported as typhoid fever without intestinal lesions such hyperplasia had at one time existed and that there had been ample time for a *restitutio ad integrum* before the post-mortem took place.

On the Etiology of Head-shaking with Nystagmus (Spasmus Nutans) in Infants.—THOMSON (*Festschrift in Honor of Abraham Jacobi*, 1900, p. 65) contributes an interesting paper on a functional co-ordination neurosis which affects young children, and which he chooses to designate under the names *spasmus nutans* or head-shaking.

Clinically there are two cardinal symptoms—involuntary head movements and ocular nystagmus. These are both present in the majority of cases. In some, however, only head-shaking is observed. The association between the head movements and those of the eyes is illustrated by two facts. When closure of the unsteady eyes takes place naturally in sleep, or is artificially produced by the application of wadding and a bandage, the head-shaking ceases; also when the head is passively steadied by the hands the nystagmus increases or may appear for the first time.

Thomson's paper is based on the study of eighty-eight cases collected from the literature, and particularly on thirty-five other cases which came under his own personal observation.

Concerning the etiology of the disease, the nervous mechanism, whose function is at fault, is evidently that which includes the semicircular canals in its circuit, and which regulates the co-ordination of the movements of the eyes with those of the head. Alex. Bruce thinks that the nucleus of Deiters is in all probability the seat of the disturbance.

Over three-fourths of the published cases, including Thomson's own, began between four and twelve months of age. This corresponds to the period during which the child is slowly learning to co-ordinate the movements of the eyes with those of the head. The condition is commoner in females, twenty of Thomson's thirty-five cases being in girl infants. Rarely is there any neurotic history in the family, and the intellect of the child is not impaired. Reflex irritation is a minor causative factor.

Defective light in the home seems to be the most important, if not essential, element in the causation. An investigation showed that practically all the cases occurred in insufficiently lighted houses. In further support of the defective light theory are the facts that in the majority of the cases the symptoms began in December or January, the darkest months in the year, and that the disease is practically confined to towns.

The vast majority of the infants suffer from rickets. In thirty-three of Thomson's thirty-five cases there were undoubted signs of the disease. Doubt is expressed whether the connection between rickets and *spasmus nutans* is of exactly the same kind as that between rickets and laryngismus, convulsions and tetany.

Thomson says: "From a review of these etiological factors we may conclude that the age of the patients, the absence of sufficient light in their surroundings, and the presence of rickets are the most important influences in determining the onset of the disease; likewise that anything which temporarily or permanently lowers the vitality may predispose to its occurrence."

SURGERY.

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A Contribution to the Surgery of Perforated Gastric Ulcer.—MITCHELL (*British Medical Journal*, March 10, 1900) has collected thirteen cases of gastric ulcer that have recently been operated upon. The statistical value is due to the fact that successful and unsuccessful cases are alike recorded, and the result—thirteen cases, with six recoveries—must be regarded as eminently satisfactory. The first case operated on by the author was nearly hopeless, as it was sixty hours after perforation. In another the wall of the stomach was so rotten that it tore to the extent of one and one-half inches, and a large mass of tissue, apparently malignant, occupied the anterior wall of the organ at some distance from the ulcer.

The symptoms of the average case are given as follows: A patient, male or female, with or without a history of previous gastric symptoms, is suddenly seized with violent abdominal pain, immediately followed by profound shock and collapse, and perhaps by vomiting. The pain, which may at first have been localized, rapidly becomes general. The abdomen becomes intensely tender, with its muscles hard and rigid. On percussion there is a tympanitic note all over; possibly there is a diminished area of hepatic dulness, especially in front. The bowels are inactive. The patient is cold and livid, with subnormal temperature, has a quick, feeble pulse, thoracic respiration, anxious expression, and suffers from intense thirst. Soon a period of repose commences, when the sufferer feels distinctly easier, the pulse improves a little as the initial shock passes off; the abdominal retraction is replaced by slight distention, and liver dulness becomes markedly diminished. In a short time, however, the pain returns, tenderness increases, the temperature rises, and the patient exhibits all the signs of general septic peritonitis; or in the more fortunate cases the peritonitis is localized by adhesions, and an abscess forms. Thus the characteristic symptoms of per-

foration are sudden onset, violent pain, profound shock, intense tenderness, rigidly contracted abdominal muscles, shallow thoracic respiration, and absence of liver dulness.

These cases, without the interference of the surgeon, are practically hopeless, with a death-rate of over 95 per cent. The chief factors in successful intervention are, first, early diagnosis and early operation. Once you have suspected that your patient suffers from the symptoms of perforation, there is not a moment to be lost. To wait for the primary shock to pass off is unnecessary, because sufficient time must elapse in preparing for so grave an operation. The importance of early operation is demonstrated by a table that shows 77 per cent. of recoveries in cases operated on up to twelve hours; 33 per cent. in cases operated on between the twelfth and twenty-fourth hours, and 29.4 per cent. when operated on after twenty-four hours. It cannot be too clearly understood, therefore, that the lives of these patients depend on the promptness and energy of the physician who first sees the case, even more than on the skill of the operating surgeon. Above all things, the use of morphine should be avoided, if possible, until a final diagnosis is made and the line of treatment decided upon.

The other points of importance to be noted previous to operation are: (1) The nature of the last meal taken; (2) the interval between the last meal and the occurrence of perforation; (3) the position of the patient at the time of perforation. These factors are valuable in determining the distance to which the food has been driven, and the direction. In point of time the perforation usually occurs about two hours after a meal. The longer this interval the more complete will be the process of digestion and the smaller the quantity of food remaining in the stomach. The danger due to extravasation will be proportionately diminished.

From his observations in eleven of the reported cases which he operated upon or at which he was present, the author derives the following lessons: 1. The incision in the first instance should be a fairly small one, and the peritoneal opening as small as possible, in order that the gas may escape slowly. Once all doubt as to the diagnosis has been set at rest, the wound may be rapidly enlarged to the required length by the scissors. 2. The best guide to the ulcer seems to be the presence of adhesions. Having drawn gently on the stomach, you find that in some directions it is more fixed than in others. On running the finger down to this area you will generally come on a zone of induration, in the midst of which the ulcer is almost certain to be found when the adhesions have been separated. Of course, cases occur in which perforation takes place so rapidly after the onset of the ulcer that there is no time for adhesions or for induration, but they are very rare.

The bubbling up of fluid and other gastric contents is not necessarily a guide to the seat of perforation. Should a careful search fail to show the ulcer on the anterior surface it will be necessary to open the lesser sac of peritoneum, and this can be most easily done by tearing through the layers of the great omentum, when the posterior surface can be examined. In at least two cases he found it necessary to divide the left rectus transversely, in order thoroughly to expose the ulcer. It is not always possible to bring the stomach and perforation into the abdominal wound; in fact, it is usually impossible.

The ulcer need not be resected; serious hemorrhage is likely to follow. A running suture closes the wound and is buried by Lembert sutures.

The peritoneal cavity may be cleansed: 1. By sponging with sterile gauze pads, which are wonderfully effectual in removing coarse material and rapidly soaking up fluid. 2. By thorough douching with boiled water or normal salt solution. Of the six successful cases four were sponged alone; one was douched alone; while in one, in which the gastric contents had reached the pelvis, both methods were employed. The douche was employed in three unsuccessful cases, but they were at the same time the most unfavorable of the five. The resisting power of the peritoneum is the greatest feature.

Drainage should never be omitted. A gauze drain is gradually taking the place of the older methods, and a strand of this material should be introduced so as to lead down the line of suture, and one into each subphrenic space, as it is here that the abscess most frequently occurs. Although often difficult to remove on the third or fourth day, it will come away easily at the end of a week.

Perforating Duodenal Ulcers —WEIR (*Medical Record*, May 5, 1900) says of this affection that it is much more rare than the ulcer of the stomach; is much more difficult to diagnosticate properly, and is more apt to be confounded with other more distant surgical lesions, such as appendicitis, etc.

The following contrasting symptoms have been grouped as an aid to this differential diagnosis:

Gastric ulcer: (1) More frequent in women; twenty-fifth to fiftieth year. (2) Pain promptly after eating. (3) Pains relieved by vomiting. (4) Frequent biliary, mucous, and food vomiting. (5) Marked dyspeptic symptoms. (6) Frequent bloody vomiting. (7) More seldom bloody stools.

Duodenal ulcer: (1) Occurs more frequently in males. (2) Pain in right hypochondrium or to the right of the parasternal line. (3) Comes on one or two hours after meals. (4) No relief by vomiting; latter not frequent. (5) Bloody stools (melæna or bright blood) more common than bloody vomiting. (6) Jaundice, if present, would contribute to the diagnosis.

The usual symptoms of perforation are the following: Great pain is usually felt at the epigastrium or to the right of this region, as was noted twenty-six times in the author's forty-seven cases. It has a few times been observed at the umbilicus and in the left side; but in twenty-three others of the forty-seven instances it was simply recorded as abdominal pain. Vomiting often follows the attack of pain. It occurred in twenty-eight out of the thirty-four instances. Shock is not often met with, but may be severe and fatal. Peritoneal symptoms rapidly develop, with a tendency in some cases to be localized in the upper part of the abdominal cavity and in the right side; when these signs show themselves mostly to the right and at or below the level of the umbilicus, an appendicitis is necessarily simulated. When the liver dulness has disappeared nearly up to the mammary line, air extravasation may be suspected, and when present it will aid in establishing a diagnosis. This symptom of loss of liver resonance, unless marked, is so often found to be due to a distended colon that it should not be much relied on.

In considering the diagnosis of perforated duodenal ulcer as just given the author feels that more weight and attention should be given, first, to the

previous history, which shows, contrary to the opinions of many anterior observers, that in the fifty-one collected cases of operation for the relief of such conditions there was a history of gastric or dyspeptic symptoms given in twenty-five out of the thirty-four instances in which this point was noted; secondly, the fact that the initial or early pain was developed in twenty-six instances out of forty-seven in the epigastrium is also important; and in the right hypochondrium thirteen times. The third factor of value in the diagnosis as well as the treatment of the symptoms of perforation peritonitis, whether from stomach, duodenum, gall-bladder, appendix, or any other part of the intestinal tract, is the prompt resort to an exploratory incision. This need of an early determination of the site of the perforation has been shown frequently. The mortality in these cases clearly depended on whether the patient underwent surgical intervention within twenty-four hours from the inception of the perforation.

The results in the fifty-one cases reported bear out this conclusion. There were twenty-five cases in which the lesion was recognized and closed at the time of operation; of these thirteen underwent operation after thirty hours' delay, and all resulted fatally; twelve other patients were operated on within that time, and eight survived, giving thus only 33½ per cent. of mortality. The mortality was formerly 60 per cent. Thus there has been great improvement in the past five years. Before that time in 70 per cent. of the cases operated on for duodenal ulcer it was not found; it was found and sutured in 25 per cent. In only two cases, or 10 per cent., was the possibility of a duodenal perforation considered. Contrast this with the thirty-one cases operated on since 1895, when the analogous surgery of gastric ulcer began to develop. Of these thirty-one cases the perforation was not found in only 11 per cent. It was found and sutured in twenty-six cases, or 65 per cent. Its presence was considered in diagnosis in eleven cases, or 35 per cent.

The Employment of Local Anæsthesia in the Radical Cure of Certain Cases of Hernia, with a Note upon the Nervous Anatomy of the Region.—CUSHING (*Annals of Surgery*, January, 1900) bases his paper upon forty-nine cases in which the radical cure has been performed under regionary anæsthesia.

Almost all cases of hernia, with the possible exception of those in young children, could undoubtedly be subjected to the radical operation under similar local methods; but when general anæsthesia can safely be administered, for various reasons it is much to be preferred by both patient and operator.

The factors that have determined the employment of the local anæsthetic in these cases have been advanced age, chronic bronchitis and emphysema, tuberculosis, laryngeal or pulmonary, cardiovascular changes of marked degree, chronic nephritis, and, above all, the shock and vomiting in strangulation.

The two conditions chiefly responsible were the combination of arteriosclerosis with cough from chronic bronchitis and emphysema in patients past middle life, and the shock and vomiting associated with strangulation.

He discusses in detail the reasons for operating with the reason for avoiding the anæsthetic. The operation was indicated either on account of the annoyance of the hernia, though operation was not absolutely necessary, or

on account of strangulation, in which there is urgent demand for operation. The femoral operation and that in women offers so little difficulty under a local anæsthetic that it is unnecessary to discuss it in detail.

Among the cases reported are fourteen patients over sixty years of age who have been operated upon not for emergency reasons, but from choice.

"For cases of strangulation local anæsthesia is especially adapted. It is difficult or impossible to foretell the condition of the imprisoned bowel, and though the results in the viable cases are always successful, provided the patient escapes post-anæsthetization sequelæ (unfortunately, not an infrequent complication), the mortality of those cases in which the gut is found to have lost its viability has always been high. It is in the experience of many to have seen such cases die under a general anæsthetic on the operating-table. The extreme degree of toxicity of the contents of the proximal bowel, especially when the strangulation is low, is such that patients apparently in good condition may succumb to an auto-infection even after relief of the strangulation." "It is in such cases as these that general narcosis—even leaving aside the dangers of inhalation pneumonia, since constant vomiting is usually an accompaniment of these conditions—should be avoided, as it is often the additional burden which prevents recovery. This is as true of the cases in which the bowel is viable as of those with a gangrenous loop. The patient's apparent state often belies the condition of the constricted bowel. It is not uncommon to have an individual walk into the hospital with a strangulated gut which has lost its viability. On the other hand, an imprisoned but viable loop may have caused intense shock and prostration. It is for such reasons that exploration under regionary anæsthesia is demanded.

"Under a local anæsthetic without danger to the patient the sac may be exposed, the constriction relieved, the gut, if viable, reduced, and, depending entirely upon the patient's condition, a radical cure may be completed at the same time or at a later date, when general narcosis, if desirable, may be employed. If the gut is not viable, experience has demonstrated that the immediate establishment of an intestinal fistula is much the safest procedure, as this permits the immediate escape of the retained toxic products from the proximal bowel. This is readily accomplished under the local anæsthetic, and at a later date, when the patient has fully recovered, the intestinal suture may be performed with much less risk."

This series of operations has given the author the opportunity to study out with great care the distribution of the cutaneous nerve supply. The observations made are of great anatomical and physiological value, while the exact knowledge of the distribution throughout this area is essential in operating by this method.

In performing these operations the author has found Schleich's No. 2 mixture, containing 1 to 1000 parts of cocaine and 2 to 1000 parts of salt, very efficient and more reliable and lasting in its effects than the eucaine- β solutions. While, contrary to the experience of many, he has found that one or two sterilizations fail to diminish its efficiency. For anæsthetization of the individual nerve trunks he has used a 0.5 to 1 per cent. sterilized solution of eucaine- β or cocaine, which is injected directly into the nerve.

In performing the operation the patient is placed in bed for a day or two to accustom him to the position and to evacuate the bowels and bladder

while supine. Three-quarters of an hour before operation a tenth or an eighth of a grain of morphine is given, and another such dose at the time of operation. The skin is infiltrated with the Schleich solution and incised. All bleeding is stopped, as a dry wound is essential to the dissection. It is unnecessary and useless to attempt to anæsthetize the panniculus. It is not fitted for infiltration, and at the upper angle practically no nerves are encountered. This can be avoided by carrying the incision downward only at the upper angle to the aponeurosis, which is then opened in the line of the fibres from the external ring, and the iliohypogastric and inguinal nerves immediately cocainized with a 1 per cent. solution as they lie under it. After this procedure the lower angle of the incision may be painlessly carried down to the external ring and the remaining intercolumnar fibres of the aponeurotic insertion divided. The combined ilio-inguinal and genital branch, which has been cocainized at the outer limit of its exposure, is now reflected to one side or the other, care being taken not to divide it, since this leads apparently to more or less permanent paralysis of the cremaster, which is to be avoided. The rest of the operation can be completed without pain. The subcuticular silver-wire suture used in closing the skin can be placed in the infiltrated skin area without pain.

The advantages of the local anæsthetic: There is an avoidance of unpleasant or dangerous post-etherization sequelæ. There is no vomiting or retching to put strain on the sutures. Urinary disturbances are much less apt to occur, and catheterization is rarely necessary. The diet continues as before the operation. There is no backache, since there is no narcosis to induce relaxation of spinal muscles. The dressings may be applied originally to suit the comfort of the patient. Above all, is the advantage gained in being able to operate with comparative safety in patients who would incur immediate risk in submitting to general anæsthesia.

The disadvantages are: The greater time consumed in the operation and the distraction to the surgeon. The operation is doubtless more difficult, and some pain is inflicted. The degree of this depends entirely, however, upon the surgeon's familiarity with the steps of the operation and his knowledge of the anatomical distribution of the sensory nerves of the region. The slight amount of pain that is sometimes met does not compare with the discomforts of the ether convalescence, while the surgeon's difficulties are more than compensated for by his subsequent freedom from anxiety during the period of recovery from the anæsthetic and convalescence.

The Effects of Mechanical Action on Bone Growth. —MAAS (*Klin.-therap. Woch.*, 1900, No. 10), in his experiments on young guinea-pigs, found that the long-continued action of pressure or stretching produced an alteration in growing bone both in its outward form and its internal structure. These alterations are not caused by a retardation or an increase in the organic processes of structure building, but by an alteration in the relative positions occupied by the physiological amount of osseous tissue. These alterations result from the action of powerful mechanical agents that overcome the physiological power and alter its direction. Since there is actually no deficiency in the amount of bone produced, when there is a decrease in one direction there must be a complementary increase in another direction

which is free from pressure. The geometrical proportion of the development is thus altered—a decrease in length produces an increase in the thickness. In all the alterations seen in the human body the deformity results from an abnormal relation of the bone-tissue produced and not from a deficiency in the amount produced. These facts contradict the theory of a functional pathogenesis of skeletal deformities and also all inflammatory theories in connection with the pathogenesis of rhachitis.

Traumatic Diastases—WOLFF (*Centralblatt für Chirurgie*, 1900, No. 13) reports the results which the Röntgen rays have shown in the diagnosis of these separations of the epiphysis during the past two and a half years. They have given great precision to the exact differentiation between fractures and true diastasis. He gives special attention to the uncomplicated injuries of the extremities of the long bones. The separation of the epiphysis is, of course, limited by the age of the patient, and is found in patients under eighteen years of age. Thirty-four cases were seen among 525 fractures, 121 only of which were at the age when these lesions occur. During this period their relative frequency, as compared with fractures, is as one to four. The elbow-joint and the epiphysis surrounding it are most frequently the seat of the lesion. They were produced, in general, by direct violence. The dislocation of the fragments is very variable in amount. There is frequently hemorrhage into the neighboring joint. Crepitus is less harsh and pain on pressure less acute than in fractures. When the foci of ossification are small the picture revealed by the Röntgen rays is often indefinite and not easily read. The treatment is in general that of fractures—reposition and fixation. Each lesion is, however, peculiar, and it is here that the knowledge gained from the skiagraph is of great value.

When Shall We Operate in Cholelithiasis?—KOCHER (*Correspondenzblatt für schweiz. Aertze*, April 1, 1900), in answering this question, says: The indication is given by the recurrence of gallstone colic attacks, which show the presence of multiple calculi or of one that is so large that it cannot pass through the bile-ducts or can do so only with great injury to them, or, finally, where a newly-formed calculus is passed. When any of these indications are present we should not wait until secondary changes have occurred and inflammation, with its sequelæ and even perforation, may have taken place, or malignant degeneration has occurred; then recovery is seldom seen.

Is intervention indicated in cases where recovery from the attack is probable and there are no complications? He believes that operation gives the best chance, and is indicated. Simple cholecystotomy is rapidly recovered from, and with perfect technique there is no great danger, and not nearly as much as from the complications that arise from a further development of the disease or the presence of infection. The early operation may remove a great number of calculi, and the ten days required for operation and recovery are well spared when compared with the consequences of repeated attacks.

The ideal cholecystotomy consists in exposing the gall-bladder, opening it, and removing all calculi. It should then be immediately sutured and returned to the abdomen. Such an operation requires absolute asepsis and a perfect suture. The best suture this author believes to be silk. It is in-

serted only in the wall of the bladder, and does not enter the cavity, so the danger of its forming nuclei for other calculi is entirely avoided.

Kocher has performed this operation six times during the winter semester. All the patients recovered, without rise of temperature, in eight days, and were sent home in two weeks' time. This illustrates the simplicity of operation at this early period as soon as the diagnosis is established and before complications have rendered the intervention more hazardous.

He does not believe that any form of medical treatment can remove these calculi or prevent the patient from having recurrent attacks until the calculi are removed. Recurrence is not probable after all the calculi are removed, but the patient should be put upon a regulated diet, with the end in view of preventing the formation of other calculi.

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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Pulmonary Affections Consecutive to Infectious Diseases and Gastro-enteritis.—H. SPIEGELBERG (*Archiv für Kinderheilkunde*, 1899, Band xxvii., S. 367) discusses the question of the bronchopneumonias of intestinal origin, which has been sustained by Czerny in Germany, and reaches the conclusion that these bronchopneumonias are to be attributed to secondary infection of bronchial origin.

The researches were made upon 111 children, 90 of whom were one year old, 18 two years old, and 2 three years old. All had succumbed in the course of various infectious diseases, and of the number there were 29 cases of acute, subacute, or chronic gastro-enteritis, with terminal bronchopneumonia.

In all the cases associated with gastro-enteritis the lungs were found to be more or less congested, succulent, and presenting foci of lobular infiltration of variable size. Microscopically these foci were composed ordinarily of bronchioles and alveoli filled with an exudate containing round and epithelial cells. In the severer cases cellular infiltration extended into the alveolar septa and the interstitial tissue, giving a homogeneous appearance to the affected areas. In some cases in which the infectious agents were particularly virulent a superficial necrosis of the mucosa was found.

The mucous lining of the larger bronchi was congested, while that of the smaller branches was covered with purulent exudate, almost completely

filling their lumen. The epithelium was swollen and sometimes was completely desquamated. Cellular infiltration was often observed between the submucous layer and the cartilaginous walls of the bronchi.

In the bronchial and alveolar exudate, in the desquamated epithelium, and in the necrosed areas bacteria were found. They were absent from the bloodvessels, almost always so in the lymph spaces, and were found with no degree of constancy in the tissues. These bacteria were generally the same as were found in the stools. In six cases various bacilli were found, among which the colon bacillus occurred several times; nineteen times micrococci and staphylococci were found, and eight times streptococci (once in pure culture). Pneumococci were observed several times, and in six cases the *oïdium albicans*.

In the bronchopneumonias consecutive to infections other than gastro-enteritis the lesions compared with those of the preceding group presented the following peculiarities: more frequent and extensive infiltration of the interstitial connective tissue, in which the bacteria appeared massed together in clumps; relative integrity of the epithelium of the bronchi; cellulo-serous or fibrinous character of the exudate; and an intensity of capillary hyperæmia going on to the production of hemorrhages. In this group there were found bacilli in five instances; cocci in six (once staphylococci and streptococci alone, and these in association with others in the other cases); and pneumococci in four.

Histological and bacteriological examination of the intestines in the children of the first group, as to the possibility of passage of bacteria by lymphatics or bloodvessels, gave negative results. Almost always bacteria were found on the surface of the mucous membrane and about the excretory ducts of the glands; in the submucous tissue ulcerations were found, but never bacteria in the lymphatic apparatus or in the mesenteric ganglia.

In seven cases the blood was examined during life; it was found sterile in four cases, and contained streptococci in three; but in these three cases the port of entry was certainly not the intestine.

The author, therefore, concludes that in the immense majority of cases bronchopneumonia occurring in the course of gastro-enteritis is due to a bronchogenic infection.

Extract of the Suprarenal Capsules in the Treatment of Rhachitis — W. STOELTZNER (*Jahrbuch für Kinderheilkunde*, 1900, Band i., S. 73 and 199) has made an extended study in Heubner's clinic of the action of suprarenal extract in rhachitis. The following is a *résumé* of his conclusions:

1. Suprarenal extract exercises a very favorable action upon the general state, the agitation, the perspiration, the vasomotor excitability, and especially the craniotabes of rhachitic infants. All these symptoms are often considerably ameliorated within eight to fifteen days.

2. Children thus treated rapidly become able to walk, to run, and to sit upright; the softness of the bones of the thorax disappears very rapidly, and the delayed teeth begin to appear.

3. The dimensions of the fontanelles, the deformity of the thorax, the costal rosary, the epiphyseal swellings, and the deformity of the limbs are little influenced.

4. Spasm of the glottis almost always resists this treatment.
 5. The amelioration of all the symptoms is especially manifest during the first eight days of treatment; later it is much less rapid.
 6. If the treatment be interrupted improvement ceases, or there is actually an aggravation of the condition, which yields when the treatment is begun anew.
 7. Even in the cases complicated by syphilis, enteritis, bronchitis, or bronchopneumonia, treatment by suprarenal extract produces considerable amelioration of the rhachitis.
 8. In a case of grave rhachitis treated by suprarenal extract, in which death was caused by a capillary bronchitis, the histological examination of the bones showed that there were no traces of osteoid tissue, and that even the periosteal osteophytes gave an almost complete reaction of calcified osseous tissue.
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Parotitis, with Involvement of the Submaxillary Glands.—J. HOPPE (*Münchener medicinische Wochenschrift*, 1899, No. 34) has observed among children of the asylum of Uchtsprunge an epidemic of mumps which was peculiar in affecting the submaxillary glands instead of the parotids. Sixteen cases were observed. Of these 10 began by a swelling of the left submaxillary gland and 6 of the right. In 8 cases (50 per cent.) the submaxillary of the opposite side was involved in turn from one to nine days after the onset of the disease. In 6 cases there was secondary involvement of the parotid gland two to three days after that of the submaxillary. Swelling disappeared usually in from ten to fifteen days. Three boys complained of testicular pain. There were no other complications.

Treatment of Chronic Constipation in Childhood.—H. DOERFLER (*Münchener medicinische Wochenschrift*, January 23, 1900) speaks very highly of the treatment of this often perplexing condition by the administration of butter. This should be perfectly fresh and of the best quality, and should be given pure without any vehicle. During the first month of life constipation is quite unusual and may be controlled by enemata. In the second and third month one-half to one coffeespoonful of butter may be given daily, morning and evening, until the stools are normal, then every second day. In the third and fourth months two to three coffeespoonfuls daily may be given, with a decrease in dosage after the stools have become normal. From five or six months to a year, one to three teaspoonfuls may be given every two or three days.

The Elimination by the Urine of Sugars Introduced Subcutaneously or by the Digestive Tract.—NOBÉCOURT (*Revue Mensuelle des Maladies de l'Enfance*, April, 1900, p. 161) calls attention to the fact that while the conditions which regulate absorption, assimilation, and elimination of various forms of sugar have been thoroughly studied in the adult, very little work of the kind has been done with infants. He has, therefore, undertaken an investigation of the subject with reference to the first three years of life, and has deduced some interesting conclusions. He finds that the intestinal

mucous membrane of the child has the power of transforming large quantities of lactose introduced into the intestine with the milk, and is capable of transforming single doses considerably larger than those contained in an ordinary nursing of mother's milk. In general this power is greater in the young child than in the adult, but there are numerous exceptions.

For saccharose the intestinal mucosa has an inverting action fully equal to that exhibited toward lactose. In comparing the two it is necessary to take into account the strength of the dilutions; for equal degrees of dilution the action of the intestinal mucosa appears to be equal for the two sugars. Glycosuria was never observed in healthy infants experimented upon with lactose and saccharose, but in some rachitica alimentary glycosuria was produced with glucose.

For glucose the organism of the young child has a much more marked action than has that of the adult. This action does not seem to be limited to the liver, but extends to all the tissues.

Acute Serous Meningitis and Seropurulent Meningitis Due to Streptococci.—An instructive contribution to the pathogenesis of meningeal inflammations occurring in the course of acute diseases is made by NOBÉCOURT and DELESTRE (*Annales de Médecine et Chirurgie Infantiles*, April 15, 1900, p. 261). During an epidemic of bronchopneumonia in the service of Hutinel at the Hospice des Enfants-Assistés two cases were observed, both terminating fatally, one of which presented the lesions of an acute serous cerebral meningitis, the other of a seropurulent cerebro-spinal meningitis, in both of which the same organism—a streptococcus—was found.

The first case was an infant, aged twenty months, admitted for bronchopneumonia. Five days after admission meningeal symptoms appeared: rigidity of the neck, vomiting, Kernig's sign, strabismus, irregularity of the pulse and respiration, cerebral tâche, and moderate elevation of temperature. Seven days later a measles eruption appeared coincident with an amelioration of the cerebral symptoms, but the pulmonary condition became aggravated, and death occurred on the following day. At the autopsy, in addition to the lesions of bronchopneumonia, there was observed a diffuse, œdematous congestion of the meninges of the convexity of the hemispheres, more marked posteriorly. The cerebro-spinal fluid was abundant, but clear and limpid, as was also that of the lateral ventricles. There was no solid exudate and no tubercles. The spinal meninges were unaffected. Cultures of the cerebro-spinal fluid, obtained by lumbar puncture during life and also at the autopsy, showed the presence of a streptococcus (pure).

A second case observed in a child, aged four years, who had presented meningitic symptoms for two days before death, showed at autopsy the lesions of a seropurulent cerebro-spinal meningitis. The cranial meninges were distended by a cloudy, whitish fluid rich in leucocytes. Upon the convexities the meninges were infiltrated with an opalescent exudate, especially marked about the sulci and fissures. The fluid of the lateral ventricles was abundant and cloudy. The spinal meninges at the lumbar enlargement contained cloudy fluid, and the posterior aspect of the cord at this point presented an opaline appearance. Bacteriological examination of the cerebro-spinal fluid from the lateral ventricles and from the lumbar por-

tion of the cord showed the presence in pure culture of a streptococcus analogous to that observed in the first case.

The same organism, therefore, determined in one case a serous inflammation, in the other a seropurulent one. In discussing the reason for this difference of effect the authors think that a difference in the virulence of the germ in the two cases can scarcely be invoked, since in the seropurulent case the organism was innocuous for animals; neither could the duration of the disease be considered important, since the serous inflammation evolved more slowly than the other. The hypothesis of a special resistance or a peculiar predisposition of the meninges alone remains, but these are factors which are not clearly understood.

The organism presented some interesting peculiarities. It grew poorly at first upon gelose, giving very minute punctiform colonies, resembling those of the pneumococcus. After several removes it acquired the typical characteristics of a streptococcus, giving in liquid media a deposit formed of large clumps. Morphologically it had at first the form of a diplococcus; later there were long chains when cultivated in the blood-serum of the rabbit. The organism possessed no capsule taking stain. It was virulent for neither rabbits nor mice.

THERAPEUTICS.

UNDER THE CHARGE OF

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Atmokaustis.—DR. A. VON GUÉRARD reports his results from the use of this method in twenty-one instances. For uterine hemorrhage, especially at the climacteric, this method is serviceable. The results in putrid abortion, endometritis, carcinoma, and dysmenorrhœa are uncertain. It was successfully used in a bleeder whose mother and sister had died from hemorrhage. The application was made at 239° F. for thirty seconds. Of these twenty-one patients seventeen suffered pain, in five of whom it was excessive, and this symptom was accompanied by fever. This method may be used successfully when contraindications exist to others.—*Therapeutische Monatshefte*, 1900, Heft 3, S. 154.

Soluble Silver.—DR. A. DWARETSKY reports the histories of two patients suffering from phlegmon of the hand, with septicæmia, one of the same condition of the foot, one of furunculosis with septic infection, and one of chronic osteomyelitis of the femur, with chronic septicæmia. In all inunction with the ointment was practised, and this resulted in benefit both to the local sepsis and the general septic conditions. These instances of its use fully confirm the claims of Credé and others.—*Therapeutische Monatshefte*, 1900, Heft 3, S. 145.

[Soluble silver has apparently secured a permanent position in the treatment of general sepsis.—R. W. W.]

The Treatment of Scarlet Fever Nephritis.—DR. WERTHEIMHER pleads for the methodical use of intestinal irrigation with physiological saline solution as an important adjunct to treatment. This increases diuresis and militates against or prevents uræmic symptoms. Although this acts by increasing the flow of urine, this is not its only valuable function.—*Klinisch-therapeutische Wochenschrift*, 1900, No. 11, S. 338.

Asthma and its Treatment.—DR. G. A. GILBERT bases treatment on the statements of Haig and others that the contraction of the bronchi and arterioles is often due to the accumulation of uric acid in the blood. The biurate crystals, by their points, set up a reflex irritation of the terminal branches of vagi in the bronchial mucous membrane. Frequency of attacks is in proportion to amount of uric acid. Permanent relief follows a sufficient elimination of the poison. It is noted that the paroxysms usually occur in the early morning, when the amount of uric acid is greatest, and that after an attack there is a flow of limpid, pale urine in great quantity. Thioline, the laxative salt of lithium, forms in the system the freely soluble lithium urate, which is completely eliminated by the emunctories. Potassium iodide forms urate of potash, which is only partially soluble. In addition to its solvent hydrogen action, thioline relieves arterial tension markedly, which condition always accompanies true bronchial asthma.

Method of administration: A teaspoonful in a cup of hot water every three hours until free catharsis results; thereafter the same dose is given once a day on rising. When urine is alkaline, medication is omitted for two days. In addition the diet is to be limited, strongly nitrogenous food being interdicted. Under such treatment very satisfactory results are reported; patients who have been subject to attacks for years remaining free therefrom for months at a time.—*St. Louis Medical and Surgical Journal*, 1900, vol. lxxviii., p. 125.

[Our observations tend toward the opinion that in asthma we have much more than uric acid as a prevalent causative factor. As for the value of the drug mentioned, we have found it neither more nor less valuable than other lithium salts and mixtures.—R. W. W.]

Kryofin.—DR. ALBERT BREITENSTEIN has employed this remedy chiefly as an analgesic, especially for headaches. An instance of migraine which had resisted long-continued medication was relieved by two seven-grain doses of this drug. It is also an excellent remedy for the headache of acute alcoholism. Recent sciatica, lumbago, intercostal neuralgia, and pleuritic pains are subdued by fifteen-grain doses. Insomnia in neurotic individuals is controlled. The remedy is safe and certain in its action, and does not give rise to untoward symptoms.—*Therapeutische Monatshefte*, 1900, Heft 3, S. 137.

Untoward Symptoms from Pyramidon.—DR. W. PAULI reports two instances. After five five-grain doses there was noticed painful paræsthesia of both forearms, which radiated into the fingers and increased in severity on the

following day. Three similar cases of this dosage resulted in sleeplessness: On cessation of the remedy these symptoms disappeared, to return on a repetition of the dose. The second patient showed over the face, neck, arms, joints, and chest an eruption which resembled urticaria. Upon the face these spots became confluent, and later resembled the eruptions of measles.—*Centralblatt für die gesammte Therapie*, 1900, Heft 3, S. 129.

Mercurial Neuritis.—DOTT. P. C. MADINOS reports an instance in which the pains were most marked in the knees and ankles. These were acute and lancinating and especially aggravated by any movement. Later the patellar reflex became weaker and tactile sensibility slightly blunted, while that of pain and temperature was normal. Soon œdema reaching to the knees set in, and finally fever became constant. At this time it became apparent that the mercurial inunctions which the patient was receiving were responsible for the symptoms, and not the syphilis for which he was receiving them. Intestinal antisepsis was secured with benzonaphthol and salol. Hot salt baths were administered and occasionally morphine hypodermatically for severe pain. Within a fortnight the œdema disappeared, the pain gradually lessened, and total relief came ten days later, and the patient recovered full use of his limbs. Attention is called to the fact that mercurial neuritis has not been thoroughly studied and that there is likelihood of attributing the symptoms to the disease and not to the remedy employed for it.—*Gazetta degli Ospedali e delle Cliniche*, 1900, No. 24, p. 252.

Creolin in Eczema, Psoriasis, and Other Diseases of the Skin.—DR. DAVID WALSH states that the main action of this substance is that of a mild, deodorizing antiseptic, while, in addition, it is a vascular stimulant and absorbent in dry skin diseases, and as a nervous sedative in many sensory cutaneous disturbances. In eczema and other acute inflammatory conditions a drachm to a quart of warm water may be sponged over the parts two or three times daily, followed by a dusting powder of zinc oxide. As the inflammatory condition subsides an ointment of creolin and vaseline (1:16 or 48) may be employed. This is useful for rubbing into the dry patches of psoriasis. If there is much scaling salicylic acid should be added. For all but the acute catarrhal inflammations a bath of hot water, to which a drachm of creolin is added for each gallon, is excellent. Friction should be vigorously employed. As an antipruritic a drachm to a pint of hot water, to which a few drachms of glycerin is added, gives much relief in the distressing pruritus of the aged.—*The Therapist*, 1900, No. 3, p. 62.

The Treatment of Obesity.—DR. E. HEINRICH KISCH finds that the continued use of purgatives is quite as much to be condemned as the former employment of blood-letting. Their use results in increased peristalsis and diminished absorption from the intestines, resulting in lessened nutrition and not in removal of fat. Noting the action of alkalies on fats producing soap, various authors have recommended large doses continued over considerable periods of time. Inasmuch as laboratory research shows that the result is merely a lessening of oxidation-processes, it is difficult to believe that it is efficient. Vinegar from various sources has been a popular domestic

remedy, but readily gives rise to a cachexia with various dyspeptic symptoms. Various preparations of iodine diminish flesh, but give rise to prostration and even to symptoms of iodism, as nervous unrest, insomnia, dyspnoea, palpitation. Anæmic patients should not be submitted to this treatment. Plethoric individuals, however, may be given small doses for short periods. Often local applications are useful: the size of the breasts and abdomen may be reduced by inunctions of iodine or iodide ointments; potassium iodide, 10; iodine, 1; petroleum ointment, 100. The use of diaphoretics in the treatment of obesity dates back to Galen. Of all methods the hot bath, due regard being paid to the condition of the heart and arteries, is the most useful. Recently thyroid preparations have been much lauded, although the results are not constant, and cessation of the treatment is likely to be followed by increase of weight. Their disadvantage lies in the fact that not only is the fat lost, but the albumin as well; if strict diet is not enforced in plethoric patients only moderately good results may be looked for and only exceptionally any untoward symptoms. In anæmic patients rapid loss of weight occurs and also marked cardiac and nervous symptoms, which prevent the long continuance of the remedy. If treatment at Marienbad is carried on simultaneously in plethoric patients no other effects are observed other than those from the Marienbad treatment alone excepting a more rapid appearance of prostration. If thyroid preparations are employed untoward symptoms on the part of the heart, nervous system, blood and kidneys should be looked for and the remedy stopped or diminished. In all cases the initial dose should be small and only gradually increased.—*Therapeutische Monatshefte*, 1900, Heft 2, S. 75.

Treatment of Pleurisy.—DR. G. DEBOVE recommends counter-irritants applied to the chest on the affected side, especially over the site of pain. Both dyspnoea and pain are lessened thereby. Wet cupping is indicated only when the pain is very severe. Leeches, dry cups, sinapisms, and cauterization are ordinarily effectual. Blisters are to be avoided as dirty and not devoid of danger (sepsis); further, they do not aid in the absorption of the effusion. Diuretics do not cure a pleurisy, and may have an injurious effect on the kidneys. Rational treatment consists in thoracocentesis. Age is not a contraindication. When the fluid does not exceed a pint the operation is unnecessary. Greater effusions demand it, proportionally to their size, and especially if there be dyspnoea. To avoid syncope the horizontal position during operation is preferred. Potain's or Dieulafoy's aspirator is satisfactory, and a fine needle is better than a trocar and canula. Ordinary rules of aseptic operating apply. To avoid possible injury to the intercostal artery and nerve, it is well to keep close to the upper margin of the rib in introducing the needle; the fifth space in the mid-axillary line is the point of election, for here the ribs are far apart and there is no danger of puncturing the diaphragm. Accidents following thoracocentesis are: rapid reproduction of the fluid, its purulent transformation and albuminous expectoration. Return of the fluid is due to persistence of the original cause of the pleurisy, and not to the operation. When there is recurrence a tuberculous origin is probable; such effusions easily become purulent. Liability to purulent transformation is a great drawback to thoracocentesis. It is added that many

effusions spontaneously become purulent. Albuminous expectoration follows too rapid an evacuation of a large amount of fluid. Mild degrees involve dyspnoea with continuous expectoration and cough. More severe forms include abundant expectoration with intense dyspnoea, and auscultation shows oedema of the lungs. Asphyxiation may follow. Albuminous expectoration is apparently due to congestion of the lung with acute oedema and serous invasion of alveoli. To avoid this more than one quart of fluid should never be removed at one time. A second puncture may not be required, for often small amounts of fluid remaining in the duct are rapidly absorbed. Pneumothorax is not a dangerous complication. Syncope, due to a too complete and sudden evacuation of the fluid, causes rapid congestion of the lung and consequent anæmia of the medulla. Thoracic pain is probably due to distention of the pleura when the compressed lung returns to its normal volume.—*The Medical Press and Circular*, 1900, vol. cxx., p. 181.

Diabetes Mellitus of Apparent Bacterial Origin Successfully Treated.—DR. J. P. SHERIDAN made use of mercuric chloride and failed to produce any good effects. A similar result followed the taking of gold and sodium chloride. Failure is ascribed to: 1. The specific toxin of diabetes is affected only by a specific antiseptic. 2. The above drugs when pushed to the point of intolerance do not cause a decline in glycosuria. 3. Both drugs, administered for any length of time and in large doses, reduce the oxidizing power of the red blood-cells, weakening the system, and causing rapid emaciation. In the writer's hands a preparation of gold and arsenic bromides in solution, in four instances excited an apparently specific effect on the bacteria and toxins of diabetes mellitus. The combination is given, largely diluted in water, beginning with eight to ten drops, thrice daily, and slowly increasing to the limit of toleration, usually between forty and sixty drops. The indications that the point of toleration has been passed are as for arsenic in general: swelling of the lids, puffiness of the face, diarrhoea, etc. When this point has been reached the dose is reduced five or ten drops, and thus continued for several months. Improvement in all four cases was immediate and constant. After some weeks had elapsed glucose wholly disappeared from the urine, and other symptoms likewise vanished. There was no subsequent return of symptoms. In each instance it was recommended that the patient continue to take the drugs recommended for at least six months. In addition to medication restriction of diet is advised, with reference to sugar and starches.—*New York Medical Journal*, 1900, vol. lxxi., p. 236.

The Serum Treatment of Diphtheria.—DR. A. ANDERSON shows that the mortality before antitoxin was introduced was everywhere exceedingly high. The results of comparison are: As high as 42 per cent. mortality previously (Sheffie'd), and as low as 6.77 per cent. subsequently (Chicago). It may be stated that the character of the disease has altered, being less virulent than formerly, and that more throat affections are recognized as diphtherial than heretofore. It is extremely unlikely that so virulent a disease should have become benign in so few years. Statistics show that older methods had comparatively little effect on the death-rate, whether first coming under treatment on the first or the fifth day. There is a direct relation, however, between re-

covery and the early administration of antitoxin. Series grouped according to age show a striking diminution in mortality for younger children, who are ordinarily more susceptible to the disease. One of the first effects of the administration of the antitoxin is the rapid disappearance of the membrane and the extreme rarity of further extension of the lesion. Especially is this important in laryngeal diphtherias. Formerly the death-rate for this form of the disease was 60 per cent. During 1898 it was 34 per cent., antitoxin being used. In patients requiring tracheotomy the mortality has fallen from 70 to 30 per cent. Operative interference is also less often required. Involvement of the larynx subsequent to the appearance of the membrane in the nose and pharynx indicates a late stage of the disease and that the patient has not received antitoxin. Such patients die from cardiac failure, anuria, or paralysis. Laryngeal symptoms never supervene in diphtheria where antitoxin has been already injected. Still more satisfactory results follow in post-scarlatinal diphtheria. In a certain proportion of instances complications may be caused wholly by the serum. Urticarial and erythematous rashes occur, appearing a fortnight after injection. Abscesses form in 2 per cent. of patients injected. No serious constitutional disturbance nor sloughing have been observed by the writer, and those described are probably due to some extraneous organisms in the serum; therefore, any serum that has become cloudy should be discarded. Arthritic symptoms are painful, never serious. They are more common in adults. Occurrence of albuminuria and paralysis has increased since the introduction of antitoxin; almost all severe albuminurias appear when the antitoxin has not been administered until the fifth day or later. Paralysis has increased because more patients survive to develop it than formerly. When the injection is made early paralysis is infrequent, and is mild, as a rule. The dose of the serum depends on the severity of the infection, not on the age of the patient. Early diagnosis means a small dose. Four thousand units are considered a mild dose. In severe infections four thousand units should be given every three hours, for three doses, and repeated the following day if necessary. Large doses may thus be given with impunity. To determine the necessity for a repetition of the dose, examine the false membrane. If nasal discharge was present and it has entirely ceased, injections may be discontinued. Absence of nasal discharge and a sodden appearance of the membrane, with a well-marked loosened edge indicates that little more antitoxin is required. The temperature-chart is unreliable, though fever usually diminishes in uncomplicated lesions. It is better to repeat such doses as above given than to give larger initial injections. That four thousand units is always sufficient is untrue. The aim is to neutralize the toxin before it destroys the nerve and other cells. Antitoxin has no bactericidal effect; toxins continue to be elaborated until the tissues have themselves overcome the bacteria. If the bacteria pass into the general circulation the area for the elaboration of toxins is enormously increased, and these latter must be neutralized by correspondingly large doses of antitoxin. Injections must be given at the earliest possible moment. It is best not to wait for the result of a bacteriological examination. In judging of the severity of an attack account must be taken of the susceptibility of the patient and of the virulence of the bacteria. As there is no accurate way to judge these

factors, every patient should receive antitoxin whether the symptoms appear mild or not. Paralysis and other grave complications arise as often in the apparently mild injections as in the more severe. Local treatment is also requisite. Cervical cellulitis is common in the more severe attacks. Anti-streptococcic added to antitoxic serum in such a condition gives no better results than antitoxin used alone. A serum from which the elements causing the rashes and joint pains are eliminated, as well as one of greater strength, is desirable. Whether cells partially destroyed by toxin can be restored to their normal state is problematical.—*The Quarterly Medical Journal*, 1900, vol. viii. p. 173.

Typhoid Fever in Children Treated by Cold Baths.—GLÉNARD reviews the writings of many authors, and adding his own experience, concludes that cold bathing is of great value. Typhoid fever is a serious illness in children. When treated by medicines alone the mortality amounts to 15 per cent. When cold bathing alone is used the mortality is 2.5 per cent. A combination of medicines and cold baths, the latter used as a *succedaneum*, results in 11 per cent. mortality. When both internal medication and baths are employed the prognosis is uncertain, complications are prone to occur even in most mild attacks, the duration is prolonged, and convalescence likewise. Systematic treatment with cold baths brightens the prognosis after the first few days, complications are reduced to a minimum, convalescence is short, and a persistence of sequelæ rare. Collapse, as a result of cold bathing, is also rare, and this is true, too, in pneumonia in infants treated in a similar manner—a disease in which the heart is most menaced. It is neither too cold nor too prolonged a bath that causes collapse, but delay in instituting this method of treatment, or an advanced stage of the disease with the lack of cardiac stimulants, when they are evidently required; under such conditions collapse following bathing does occur. Because the cold bath is not made the basis of treatment, collapse often occurs in patients treated both by drugs and by baths. Following is the method of bathing: Temperature of water, 72° F.; duration of bath, ten minutes; “cold affusions,” thrice repeated. To be repeated every three hours as long as the rectal temperature taken just before the bath is 102.2° F. When the fever ranges between 100.4° to 102.4° F. the bath should be given for as many minutes as the thermometer registers fifths above 100.4°. If the heart weakens a drachm or two of Bordeaux wine is indicated before and after the bath. Should collapse threaten, cold affusions are required, the bath is shortened, friction of the surface and massage are practised during the bath, and warmth applied subsequently. Subcutaneous injections of ether may be necessary. In any case as long as the temperature before the bath is 102.2° F. bathing is indicated. Each bath renders collapse less likely. The author believes that the results of treatment by the Brand method are even more satisfactory in children than in adults. In children thus treated typhoid fever is a very benign disease, and it is so only when thus treated.—*Revue de Thérapeutique*, 1900, No. 3, January 15, pp. 37 and 73.

Benefits of Balneotherapy in Chronic Rheumatism and Gout.—DR. H. H. SCHROEDER writes: It has been demonstrated that if a mammal be

placed in a bath three or four degrees higher than its own temperature excretion of carbon dioxide gas and consumption of oxygen are increased, owing to the stimulation of metabolism; urea is also excreted in large quantities. This latter increase continues for several days after a series of hot mineral-water baths. Stimulation of the cutaneous sensory nerve exercises an important influence on the most complicated processes, by means of reflexes through the central nervous system. Anything tending to intensify the stimulation of the peripheral nerves will favor greater functional activity. Probably the best results are obtained from treatment at those springs with temperatures considerably over 100° F., and containing high percentages of mineral ingredients. During immersion in such waters pathological products, exudations, hyperplasias and toxins are "drawn into solution" and eliminated from the system. Care must be used in the choice of patients for such treatment. Chronic nephritis complicated with arterio-sclerosis or hypertrophied left ventricle, valvular heart lesions, etc., are contraindications. Well compensated valvular lesions unaccompanied by renal or vascular complications suffer no inconvenience. Chronic rheumatism has usually progressed so far that thickening of the synovial and periarticular tissues has occurred. Ankylosis often follows. During these chronic stages of rheumatism balneotherapy persisted in will generally meet with gratifying results. As patients are usually in run-down condition, drastic measures are to be avoided. Natural spring waters, of high temperatures, containing much mineral matter, are best for stimulating absorption. Massage and douches are also serviceable. In gout the establishment of a more complete metabolism and the elimination of uric acid, in addition to the absorption of deposits about the joints, are to be sought for. Whatever may be the relation of uric acid to gout, measures that favor its elimination and prevent its formation are valuable in treatment. Life at a mineral-water bathing resort is conducive to this end; habits are regulated and a proper diet enforced.

Irksome treatment is willingly submitted to. Living in a pure atmosphere and taking abundant exercise, hot sulphur springs containing sodium chloride and alkaline and earthy sulphates tend to remove the various disorders in causal relationship to gout, such as indigestion, gastric and intestinal catarrh, and constipation. Senator believes that such waters exert an immediate influence on the gout diathesis, and uric-acid dyscrasia, and that permanent benefit is derived from their influence. Increase of pain often accompanies the bath. It soon ceases, as a rule. With its disappearance comes that of the disease, and immunity follows for some time if not permanent cure.—*New York Medical Journal*, 1900, vol. lxxi. p. 269.

The Use of Guaiacol in Malaria.—DR. CHARLES J. WHALEN reports twelve instances of the use of this remedy. In nearly all quinine had been used, and it had failed to cure. The dose is five drops after meals, increasing one drop each day until twenty drops three times daily are taken. From these observations he infers that the adult segmenting organism is not affected by the drug, but the free and growing spores constantly inhibiting nourishment from the blood-plasma are readily destroyed or prevented from entering new corpuscles.—*Merck's Archives*, 1900, No. 4, p. 133.

GYNECOLOGY.

UNDER THE CHARGE OF

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Œdema of the Bladder Due to Stricture—KOLISCHER (*Centralblatt für Gynäkologie*, 1900, No. 17) believes that strictures of the urethra in the female may be of congenital origin, being independent of any previous inflammatory process. They are caused by localized deposits of fibrous elastic tissue, and are only recognized clinically by using olive-pointed bougies. When seen through the endoscope they appear as semicircular or circular ridges around the canal. While in some cases they give rise to no symptoms, in others the patient complains of constant irritation and tenesmus, while the urine contains numerous epithelial cells and detritus. Cystoscopic examination of the bladder in these cases shows œdema of the mucous membrane at the neck of the bladder, which may involve the mucosa generally. Instead of presenting the usual deep-red color, it is pale and swollen, resembling wet absorbent cotton.

In many instances, through diminished vitality of the mucosa or actual infection, there may be an actual loss of substance over the œdematous area, which in time results in the formation of an ulcer. Treatment is useless as long as the presence of the stricture—the true cause of the œdema—is unrecognized. Internal urethrotomy followed by applications of iodoform to the ulcer effects a cure.

In conclusion, the writer insists upon the importance of a thorough cystoscopic examination in young women with obstinate vesical symptoms, even though the usual etiological factors—gonorrhœa and puerperal lesions—are absent.

Abnormal Openings of the Ureters.—BENCKHISER (*Zeitschrift für Geb. u. Gyn.*, Band xli., Heft 3) adds two cases to the twenty-five already reported. In one a ureter opened below and to the outer side of the meatus; in the other an accessory left ureter opened in a similar locality. In the first case, after extirpating the lower end of the ureter, a fistula was left in the upper third of the vagina; in the second the lower portion of the accessory ureter was extirpated and the upper portion was turned into the bladder.

OLSHAUSEN (*Ibid.*) describes two additional cases, one in a child, aged ten years, in which the opening of the right ureter was situated near the right edge of the hymen. The absence of the right uterine opening in the bladder was demonstrated by the cystoscope. In the second case the opening of an accessory ureter was found near the meatus. The distal end was resected and an unsuccessful attempt was made to suture the proximal end in the urethra. Eventually a successful anastomosis with the bladder was effected.

Treatment of Incontinence of Urine.—ZIEGENSPECK (*Deutsche Arztezeitung*, 1900, Heft 14) summarizes the treatment of incontinence (when not due to fistulæ, cystitis, or parametritis) as follows: 1. Massage of the urethra and neck of the bladder, according to Brandt's method. 2. Dilatation of the vesical sphincter with sounds, as suggested by Sänger. 3. Suture of the sphincter muscle by introducing a sound into the bladder to serve as a guide, and then passing a silkworm-gut suture around the urethra and neck of the bladder, the suture being tied in the vagina and left *in situ* for eight or ten days. 4. Resection of the sphincter muscle, by cutting down upon a sound as a guide, excising 0.5 cm. of the muscle, and suturing the ends with fine catgut, a catheter being left in the bladder.

[No mention is made of the use of the faradic current, which is a valuable agent for restoring the tone of the relaxed sphincter muscle, and ought certainly to be tried before resorting to the cutting operation.—ED.]

Angiotripsy.—RATCHINSKY (*Revue de Gyn. et de Chir. Abdom.*; *Centralblatt für Gynäkologie*, 1900, No. 17), from experiments on animals, finds that while the lumen of the compressed vessel is occluded, the adhesion of the intima is not invariable, while the tunica externa has a tendency to return to its former condition, thus allowing subsequent hemorrhage. He concludes that while complete hæmostasis is possible with the use of the angiotribe, in some cases it is only temporary. In vaginal hysterectomy secondary hemorrhage is not infrequent, and may even necessitate abdominal section. Further experience with the instrument is necessary. The use of the heavier models is attended with considerable danger.

Results of Castration.—ALTERTHENN (*Hegar's Beiträge zur Geb. u. Gyn.*, Band ii., Heft 1) reports the results of his observation in 107 cases of double oöphorectomy, including twenty-four cases of supravaginal amputation of the uterus.

Complete cessation of menstruation occurred in all the cases of supravaginal amputation. In 55.5 per cent. of the others the menopause was established at once; in 25.8 per cent. hemorrhages persisted for different periods, but eventually ceased. In 18.7 per cent. menstruation still continued. Menstrual molimina ceased with the cessation of the flow. Post-climacteric phenomena were almost constant, although they were less frequent and severe after supravaginal amputation with removal of the adnexa. Diminution of sexual feelings was noted in over 68 per cent. Increase in hairy growth and pigmentation was not observed, and only once a change in the voice. An increase in the body weight was noted in 29.5 per cent.

Involution of the vagina and external genitals (contraction, stricture, etc.) was quite constant. When uterine fibromyomata were present they diminished in size in 97 per cent. of the cases.

In conclusion, the writer infers that the importance of conservative treatment of the ovaries has been overestimated. He is opposed to the view of Abel and Schmitz, that the ovaries should be preserved in cases of myomectomy, since experience has shown that a second coeliotomy may be necessary in order to remove them.

[So much has been written in unqualified support of the practice of pre-

serving portions of ovaries that it is well to have some evidence on the other side of the question. While the practice of conservative surgery is most commendable, it is only fair to state that conservatism has often been carried too far, a second operation being necessary to restore the patient to health.—ED.]

Pyosalpinx with Vaginal Atresia.—GODART (*Policlinico; Centralblatt für Gynäkologie*, 1900, No. 17) reports the case of a married woman, aged twenty-five years, with painful and scanty menstruation, whose vagina was less than three inches in depth, ending in a cul-de-sac. As a small, adherent uterus could be felt per vaginam, the os was exposed by blunt dissection, and dilatation and curettement were performed, after which the abdomen was opened. An adherent pus-tube was removed and the uterus replaced and sutured in position. The left tube was healthy. Pus from the tube contained staphylococci, the origin of which was unknown, as it did not seem possible that they could have penetrated from without, in view of the congenital atresia of the vagina.

Prevention of Conception.—In a discussion of this delicate theme before the Hamburg Obstetrical Society (*Centralblatt für Gynäkologie*, 1900, No. 18) various methods were proposed, none of which appeared to be certain. Objections were made to so-called occlusive pessaries, since they frequently gave rise to endometritis, and were harmful in cases of inflammatory disease of the pelvic organs. It was agreed that under some conditions the physician was justified in trying to prevent conception.

In cases of extreme pelvic contraction, tuberculosis, and other wasting diseases it was advised that ligation or resection of both tubes be practised when the abdomen was opened for other reasons.

Mortality After Coeliotomy for Tubercular Ascites.—WUNDERLICH (*Archiv für Gynäkologie*, Band lix., Heft 1) utters a warning against indiscriminate operations for tuberculosis of the peritoneum. Analyzing 500 cases, he finds that 68 per cent. were of the exudative variety, 27 per cent. the fibro-adhesive, and 4 per cent. purulent. Two-thirds of the first class were observed at least three years, and in 23 per cent. of these the ascitic fluid accumulated rapidly after operation. In the 344 cases of the exudative variety the primary mortality was 22.6 per cent.; 23 per cent. were well three or more years after operation. Operations were most unfavorable in the suppurative variety, over 50 per cent. succumbing at once or a short time after.

The writer has no doubt that abdominal section has a favorable influence upon tuberculosis of the peritoneum, but would not go so far as to affirm that it is the only and certain means of effecting a cure. Spontaneous cure undoubtedly occurs, and it is possible, as Galti and Hildebrandt believe, that the most successful results are obtained in cases in which retrograde processes have already begun in the tubercular nodules when the abdomen is opened. Cases for operation should be carefully selected. Simple ascites without complications offers the best prospect of a permanent cure.

OBSTETRICS.

UNDER THE CHARGE OF

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The Pathology and Symptoms of Degeneration of the Chorion.—In the *Transactions of the Obstetrical Society of London* for 1899, p. 303, WILLIAMSON reviews briefly the early writings upon the pathology of this condition. Hydatid degeneration of the chorion is believed to be closely allied to the myxoma fibrosum described by Virchow. It is thought that the degeneration of the chorion precedes the death of the embryo, as might naturally be expected. Williamson doubts the foetal origin of the hydatid disease, and quotes cases of repeated molar pregnancies occurring in the same woman.

The frequency of this condition is thought to be one in twenty-four hundred pregnancies. Hydatidiform pregnancy may occur at any time during the child-bearing period, the age of the woman having very little influence. It is more frequent in those who have borne few children, and in these patients previous pregnancies have not followed each other with great rapidity. The usual symptoms of pregnancy are present excepting uterine souffle and foetal heart sounds, although occasionally these are heard. The one sign which is constantly present is enlargement of the uterus.

In diagnosticating the condition we find some cases in which the uterus is larger than would be expected from the probable duration of pregnancy. In the second class of cases the womb is considerably smaller. Uterine tenderness is generally present.

Another diagnostic point is discharges from the vagina, with or without cystic material. The third diagnostic point is the occurrence of hemorrhage.

We must separate in diagnosis from this condition concealed accidental hemorrhage and placenta prævia, and the discharge of a pelvic hydatid through the vagina, and also polyhydramnios, especially if combined with hydrorrhœa gravidarum.

In the treatment of these patients albuminuria is a frequent complication. In one form of albuminuria blood and epithelial casts are not present in the urine. In the other these structures are found during the pregnancy. Another complication is hemorrhage, which is seldom fatal in itself. The third complication is septic infection in the form of sapræmia, septicæmia, and pyæmia. This, unfortunately, is of frequent occurrence and demands careful consideration. The mortality of the twenty-five cases which Williamson has collected was 20 per cent. The mortality of ten consecutive cases from St. Bartholomew's Hospital was 30 per cent.

[A most interesting point was brought out in the discussion by Fraenkel, of Breslau, in which he stated that according to recent researches hydatidiform mole is not a true myxoma, but a myxomatous degeneration of stroma, with very active growth of the epithelium of the villi. It is essentially

a chorio-epithelioma benignum. If retained remnants of a mole undergo malignant development there occurs a deciduoma malignum. This view is that of the most recent observers, and distinctly adverse to the belief which considers deciduoma malignum an ordinary sarcoma of the uterus and hydatidiform mole as a myxoma of the chorionic villi.—ED.]

Acute Peritonitis without Known Cause Complicating Pregnancy and Labor.—In the *Transactions of the Obstetrical Society of London*, 1899, p. 389, PHILLIPS reports the following very interesting case. The patient was a woman, aged thirty-two years, who had one child, and was pregnant for the second time. She was uncertain regarding the period of pregnancy, but was probably between the sixth and seventh month. She fell, striking herself with considerable violence against the back of a chair on the left side of the abdomen. Violent sickness and severe pain followed. Up to this time she had been perfectly well, without vaginal discharge of any kind. The pain became so severe that medical attendance was summoned, and the patient was found to have a temperature of 103° F. and a pulse of 120. The pain started in the left iliac fossa and extended upward along the left side of the chest to the corresponding side of the head, also downward along the thigh. The uterus was contracting, and the internal os easily admitted two fingers. There was slight tenderness over a small area in the left iliac fossa. There was positively no evidence of peritonitis.

The patient was admitted to the British Lying-in Hospital, and opium was given and fomentations used to relieve the pain. Shortly afterward a living foetus was expelled in the membranes, apparently without pains. Soon after labor the patient's pulse became 140, her respiration 30, while the abdomen was greatly distended. The placenta was expelled without bleeding. Obstinate vomiting continued.

The patient's condition demanded operation and the abdomen was opened. The intestines were greatly distended. The roof of the pelvis was covered with a thick, straw-colored membrane in patches. In both iliac fossæ there was a little semi-purulent fluid. The right Fallopian tube was purple red in color, smooth and glistening, and at the abdominal ostium was a large flake of lymph. On removing this the ostium was found to be patent. The uterus was purple in color, its surface covered with a few flakes of lymph. The left Fallopian tube seemed healthy. Both ovaries were swollen and their vessels engorged. The appendix was healthy, the ascending and descending colon full of soft feces. The peritoneal cavity was washed out with normal salt solution and a quart allowed to remain. The patient soon died.

Autopsy showed soft and purulent lymph in the lower portions of both pleuræ. There was general peritonitis, the intestines being glued together with purulent lymph. There was no rupture of stomach or intestines. Deep in the cervix there was a great deal of bruising and ecchymosis, but no sloughing. No purulent foci were found in the uterus, nor were its walls perforated. No focus of infection or cause of the peritonitis could be found. A bacteriological examination was not made.

The writer has collected five similar cases. In one of these drugs had been used to produce abortion, but nothing had been done to the uterus. This patient died of peritonitis, the abdomen containing fetid, purulent

fluid. Simpson reports the case of a woman at full term who came into labor. The first stage was long and progress very slow, and during the first stage the patient suddenly died. On autopsy peritonitis and agglutination of the intestines were found. No cause could be discovered. Romiti has described the case of a young primipara who was struck in the abdomen. Labor came on, and was quick and normal. Death soon followed. Upon autopsy about a quart of blood was found in the pelvic cavity, and in the left ovary a ruptured follicle with clot. The bleeding appeared to be the cause of the peritonitis. Gow saw the case of a multipara, who, a month before term, slipped through a hole in a rotten floor, injuring the abdomen. When labor came on she was suddenly seized with nausea and severe abdominal pain. The patient died undelivered, and post-mortem Cæsarean operation failed to save the child. On autopsy, peritonitis was present, for which no cause could be found.

In discussion it was suggested that the bacillus coli communis might have been forced through the wall of the intestine, causing the condition present.

Fibromyomata and Pregnancy.—In the *Zeitschrift für Geburtshülfe und Gynäkologie*, 1900, Band xlii., Heft 3, HOFMEIER contributes an interesting paper upon this subject.

Upon analyzing his statistics he finds myomatous tumors equally frequent among married and unmarried women. He does not believe that the myomatous tumor itself causes sterility. From the analysis of his cases he finds that very few of these patients during the pregnant condition required especial treatment, and that in very few would he be justified in operating during pregnancy. When, however, labor comes on in these cases, should delay occur and the patient seem threatened with exhaustion, operation should be undertaken at once. Where the patient can be delivered without hysterectomy, Hofmeier has not seen grave complications in the delivery of the placenta. In forty-two cases under his observation but two died, one suddenly from dilatation of the heart or embolus, and the other sixteen days after delivery of septic infection.

As regards cases in which the tumor is removed and the uterus allowed to remain, Hofmeier calls attention to the statistics of Engstroem. In twenty-two patients operated upon in this way pregnancy occurred subsequently in four.

[Our experience coincides largely with that of Hofmeier. In cases where the fibroid growth invades the greater portion of the uterus the physician must not expect prompt and vigorous labor, and should be prepared to operate in the interests of mother and child. When but one tumor is present delivery through the vagina may occur in spite of unfavorable indications. Forceps and version have been useful in a number of these cases in our experience. Attention must be directed to the danger of infection, and this is especially true when the placenta is attached at or near the site of the tumor. In such a case the placenta might not be delivered spontaneously, but would become partly separated, giving rise to bleeding. Should the patient become infected during the removal of the placenta, the septic poison would enter the sinuses of the womb and a rapid and violent process result.—ED.]

OPHTHALMOLOGY.

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Iodic-acid Solutions for Trachoma.—A. SCHIELE (Kursk) claims to have cured 78 out of 100 cases of this disease by applications of a watery solution of iodic acid (IO_3H). The solution used for pencilling the lids had the strength of 5 per cent. To drop into the eye, 2 or 3 per cent. solutions were used. The applications caused sharp pain. Experiments seem to show that such solutions penetrate and act deeply upon the diseased tissue.—*Centralblatt für praktische Augenheilkunde*, April, 1900.

Iodine Solutions for Trachoma.—H. H. SEABROOK (New York) has tried the treatment with iodine dissolved in a petroleum preparation, as recommended by Nesnamoff (see this JOURNAL for May, 1898). He finds that slight cases of granular lids may be cured in two or three weeks, while severe cases may require as many months, but the pannus begins to improve markedly in the first week or two. For mild cases the 1 per cent. solution is applied every other day; in more severe cases a 2 per cent. solution. Stronger solutions may be made by the addition of ether, but they are more painful. It is necessary that the iodine should penetrate the conjunctival surface, in order to produce the proper effect. In severe cases with frog-spawn granulations these were scarified or squeezed, and the iodine solution used as after-treatment.—*New York Eye and Ear Infirmary Reports*, January, 1900.

[Since noticing Nesnamoff's paper we have used this treatment and find it distinctly superior to many of the methods in common use. It is certainly worthy of much wider attention than it has yet received.—ED.]

Ocular Lesions of Typhoid Fever.—E. KOENIG (Paris) reports a case of optic neuritis and divergent strabismus without ptosis coming on at the end of the third week of typhoid fever. The patient was a woman, aged twenty-three years, who for three years had been subject to epileptic seizures. The fields of vision were concentrically contracted, and the right eye, which was in all respects the worse, had a relative central scotoma. The ophthalmoscopic appearances were those of retrobulbar neuritis rather than of choked disk.

M. ANTONELLI (Paris) reports congenital ocular defects in a child whose mother suffered from severe typhoid fever from the fourth to the sixth

month of her pregnancy. Both eyes presented anterior polar and cortical cataracts. There were nystagmus, gray, irregular optic disks, vascular changes, and pigment changes throughout the fundus. The child was the second of three, both the others being quite healthy. It was very small at birth and delicate, and the dentition had been somewhat irregular.

In discussing the above cases M. Boucheron said that choroidal hemorrhage was the common lesion of the eye in typhoid fever. The hemorrhage as such quickly disappeared, but the scar caused by it remained.—*Recueil d'Ophthalmologie*, February, 1900.

Visual Disturbances in Acromegaly.—W. A. HOLDEN (New York) finds that the gross changes in the optic chiasm occur in the following order:

First, the posterior portion of the chiasm is compressed by the pituitary body. Following this, the posterior and middle portions of the chiasm are flattened and forced upward, and thus separated from the anterior portion, which is protected by the bone beneath it. Later, with this tilting upward of the chiasm posteriorly and the forcing forward of the anterior wall of the pituitary fossa, the anterior portion of the chiasm is encroached upon by the pituitary body and arched directly forward. Finally, the chiasm may be severed completely.

Visual disturbances have been noted in about one-half of the reported cases. In over 50 per cent. of these there has been concentric contraction of the visual field, with diminution of central acuteness of vision. In somewhat less than 50 per cent. there has been bitemporal hemianopsia, absolute or for colors only, with or without some contraction of the nasal halves of the fields. In half a dozen cases there has been homonymous hemianopsia, absolute or for colors only; and in one case there was found binasal hemianopsia.

There is no special time for the appearance of visual symptoms in acromegaly. These come on, occasionally, soon after the enlargement of the extremities is noticed, but usually not until years after, and the disease may exist for ten or fifteen years without the appearance of any visual disturbance whatever.—*Archives of Neurology and Psychopathology*, vol. ii.

Hereditary Optic Atrophy.—R. D. BATTEN (London) reports three cases of this affection occurring in brothers exposed to lead-poisoning. All three were plumbers, but there was no sign of lead paralysis and no history of colic. Neither was there any history of other cases of blindness in the family. The toxic influence of alcohol and tobacco could not be excluded. But none of the cases showed any tendency to improvement under treatment and the withholding of these drugs. In one of the cases there occurred an acute neuritis.—*Ophthalmic Review*, June, 1900.

H. F. HANSELL (Philadelphia) reports a case of double acute retrobulbar neuritis occurring at the age of fifty-six years in a man, several of whose uncles and aunts became nearly blind in adult life, and who had two brothers in the same condition.—*American Journal of Ophthalmology*, June, 1900.

[The bilateral character of the lesions in these cases separates them from the ordinary form of retrobulbar optic neuritis. The failure to improve under treatment commenced early, while the exclusion of alcohol and tobacco

separates them from the more common form of toxic amblyopia. That even the most typical cases of hereditary optic atrophy may begin with retinitis or neuro-retinitis has been pointed out by some recent observers, so that both of the above writers are in harmony with the general trend of professional thought in recognizing the hereditary or family factor as an important one in causation.—ED.]

Treatment of Corneal Ulcers by Electrolysis.—FRANK CORNWALL (San Francisco) states there are ulcers of the cornea that at times have the appearance of being progressive, yet which remain for weeks, characterized by slight if any invasion, and in which photophobia and reflex neuralgia are very great. Electrolysis is indicated in these cases and also in what are called serpiginous ulcers. Its broadest field of usefulness, however, compared with any other method, is in chronic central ulcers which are very slight, the repair being almost complete.

In the treatment of these cases the voltage must be very low and the ampèreage not more than $\frac{1}{2}$ milliampère. Operating under a magnifying lens the parts where the epithelial disturbance is greatest may be slightly touched with the end of the needle. If there are parts wherein Bowman's membrane seems involved, deeper and more thorough work will be needed, but caution should be exercised, and not too much done at one sitting.

Cornwall has given this treatment a trial in phlyctenular ulcers of the cornea, and the results have always been to aggravate the condition.—*Archives of Ophthalmology*, January, 1900.

The Analgesic and Therapeutic Value of Dionin.—A. DARIER (Paris) thinks his experiments have demonstrated that in dionin we possess an analgesic capable of relieving for many hours the most violent ocular pain in iritis, corneal ulcer, glaucoma, etc. He has employed it in 5 per cent. solution instilled into the conjunctival sac or injected beneath the conjunctiva. The 10 per cent. solution, he finds, is not stable. He has also used it by placing the powdered drug in contact with the conjunctiva. However applied, it at first causes severe burning pain and œdema of the part.—*La Clinique Ophthalmologie*, 1900, Nos. 6 and 7.

DAXENBERGER (Regensburg) reports two cases in which the severe reaction produced by applications of this drug continued as long as thirty-six hours.—*Wochenschrift für Therapie und Hygiene des Auges*, May 10, 1900.

A. GRAEFE (Berlin), from a trial of dionin in 200 cases, finds its influence is favorable in all affections of the cornea (except in the keratitis due to sarcoma), in conjunctival catarrh, acute or chronic, and in disease of the vitreous. It is also valuable associated with atropine in the treatment of iritis and irido-cyclitis, and probably also chorio-retinitis.—*Deutsche medicinische Wochenschrift*, March 22, 1900.

[All observers agree that dionin exerts a powerful influence over the nutrition of the eye and particularly over the lymph-circulation of the parts; and, so far, the only injurious effects recorded are the pain which occurs in all cases and the prolonged inflammatory reaction, which must be an unusual idiosyncrasy; but the œdema it causes might at times prove a serious complication.—ED.]

OTOLOGY.

UNDER THE CHARGE OF

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Vibratory Pneumomassage of the External Ear in Chronic Deafness.—OSTMANN (*Ann. des mal. de l'Oreille*, November, 1899) employs the electric masseur of Hirschmann, of Berlin, in application of *pneumatic* impulses to the membrana tympani in chronic hypertrophic otitis media. The massage is kept up for ten minutes at a time, and sometimes longer, every day for two weeks, from 1000 to 1200 impulses being applied at a sitting. He concludes that vibration massage (aërial) is indicated: (1) In chronic deafness consecutive to chronic hypertrophic otitis media. Before this treatment of the ear is applied Ostmann urges the necessity of treating all nasal, pharyngeal, and tubal lesions, in order to avoid a recurrence of disease in the middle ear. (2) In chronic deafness supervening upon acute catarrhal otitis media, defying all other treatment. Vibratory (pneumo) massage is contraindicated (1) in all acute inflammations of the conducting apparatus of the ear. (2) In all cases in which a lesion exists in the percipient apparatus of the ear, the conduction of sound remaining normal. (3) Considering its mode of action, pneumomassage is contraindicated in otitis media that has already induced impaction of the ossicles, or an extensive atrophy of the membrana tympani, or adhesions of the membrane with the promontory.

[It would seem from notes of four cases given by Ostmann that the hearing is greatly improved by the above mode of treatment continued daily for from two to four weeks.]

Acute Bi-cameral Brain Abscess After Opening the Mastoid; Recovery.—H. SELIGMAN (*Archives of Otology*, August, 1899) has reported the case of a young man, aged twenty years, the subject of a purulent otitis media since childhood. A mastoid trephination was performed, the indications for it not being given. Caries in the roof of the antrum was discovered and the diseased tegmen removed. Three days later symptoms of brain abscess, probably in the temporosphenoidal lobe, set in. On the eighth day the squama was trephined by chiselling, and after incision of the unpulsating dura a needle introduced into the brain upward and inward revealed the presence of pus at a depth of 3 cm. The abscess-cavity was then opened and its fetid contents washed out. The symptoms of brain pressure from abscess did not diminish, but rather increased, and included some tremor in the left hand, paraphasia, and then amnesic aphasia. On the eighteenth day after the first operation on the mastoid the symptoms of brain tension suddenly disappeared, with a simultaneous increase in the quantity of fetid pus in the dressings of the wound. It was, therefore, judged that an adjoining abscess had ruptured into the first one and had discharged itself out-

wardly. Muscular twitching ceased on the twentieth day, and on the thirty-sixth day the patient left his bed, but discharge of pus continued for some days after this date.

Cerebral Abscess Following Influenza Otitis.—VOUZELLE (*Ann. des mal. de l'Oreille*, September, 1898, p. 258) reports the occurrence of an abscess in the temporal lobe following an acute influenza otitis in a man aged twenty-six years. The man was trephined on two different occasions, but died. At the autopsy an abscess the size of a pigeon's egg was found in the temporal lobe in communication with the sphenoidal prolongation of the lateral ventricle by means of a narrow opening. The opening in the parietal region of the cranium did not enable the operator to reach the abscess, and after the autopsy Vouzelle concluded that trepanation of the mastoid should always be performed in the presence of grave general phenomena, even if the mastoid itself presents no symptoms of redness, tenderness, or swelling, because an otitic abscess of the brain must be sought for near the base of the petrous part of the temporal bone.

Unilateral Paralysis of Cerebral Nerves Produced by a Tumor Originating in the Maxillary Sinus.—MINGAZZINI and LOMBI (*Ann. des mal. de l'Oreille*, August, 1898, p. 173) report a case of paralysis on the left side of several cranial nerves due to a sarcoma originating in the left maxillary sinus, and, having destroyed the turbinated bones, encroached upon the nasopharynx, and involved the cavernous sinus, implicating the cerebral nerves of that side. The symptoms, which existed only on the left side, consisted in anosmia, dimness of vision, complete ophthalmoplegia, anæsthesia of the trigeminus, paralysis of the facial, of the glosso-pharyngeal, and of the hypoglossal. The ophthalmoscopic examination was negative.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Diseases Due to Ingestion of Oysters and Other Mollusks, and their Prevention.—The occurrence of cases of typhoid fever in France, England, and America due to eating infected oysters led the French Government to institute an investigation of the causes of contamination and the manner of its occurrence in oyster beds. This was entrusted to Dr. MOSNY, who has now contributed an elaborate and important paper on the general subject of mollusk poisoning (*Revue d'Hygiene*, December, 1899, pp. 1057-1105; Janu-

ary, 1900, pp. 12-62 ; February, 1900, pp. 102-142 ; and March, 1900, pp. 193-212). He calls attention to the marked analogy in the symptoms observed in the numerous cases of illness caused by the ingestion of mollusks in general, from which it appears that the particular species plays no part, the mollusk being simply the passive agent by which the poison is conveyed. Certain pathogenic bacteria have been demonstrated beyond a doubt both in the tissues of the mollusks themselves and in the water retained between their shells, and experiments have proved that their vitality can be retained for a considerably longer time than that which ordinarily elapses between collection and sale to the public. The researches made in England, America, France, Germany, and Italy all throw light upon the origin and causes of contamination of oyster beds, and prove that the danger is neither as great nor as wide-spread as one is apt to fear, and that the trouble may be averted by transferring the beds, abandoning such as are exposed to contamination, or suppressing, when possible, the sources of infection.

Many of the very numerous cases of poisoning by mollusks are properly to be ascribed to decomposing specimens, just as is the fact in many cases of meat-poisoning, and these must be carefully separated from those due to the accidental presence of pathogenic organisms in fresh food materials. Some cases are idiosyncratic in character, for many persons cannot eat mussels from any source without evidence of serious disturbance, including headache, abdominal pain, nausea, vomiting, urticaria lasting from a few hours to several days, fainting, and delirium, just as others cannot eat crabs, lobsters, and various species of fish. In another class of cases of mussel poisoning individual predisposition plays no part, the symptoms appearing in all or almost all the persons who have eaten from the same lot. Of this class the well-known outbreak at Wilhelmshaven is a most striking example ; all who ate, nineteen in number, were stricken, and four died. Here the cause was definitely ascertained to be a toxic alkaloidal substance in the liver of the mussel, and animal experimentation produced symptoms identical with those observed in the victims of the outbreak and closely analogous to the effects produced by curare. It was further shown that the mussels were poisonous only in the dock where they were gathered ; that other forms of fish life from the same place were equally toxic, and that wholesome mussels placed in the dock became toxic in a short time and lost their poisonous properties rapidly after being returned to their original source. Hence, either the poison or its exciting cause must be held to reside in the water where the mussels were gathered.

Intolerance of certain persons for oysters is less commonly observed, and idiosyncrasy plays a much smaller part in the manifestation of disturbance from this cause. Cases of oyster poisoning may be divided into five classes, according to the symptoms. In the class in which nervous phenomena are predominant the symptoms remind one of curare poisoning. This type is extremely rare, always severe, and generally quickly fatal. The second class includes those cases in which the symptoms are gastro-intestinal. These cases are the most common, and least lasting and serious. The symptoms, which include violent colic, cold sweats, pericardial pain, and nausea, with or without vomiting, appear suddenly. In some cases the liquid, bilious stools persist, without colic, as long as four or five days. In the third class

the gastro-intestinal phenomena assume a very severe character, and suggest more or less strongly the clinical picture of dysentery. In these cases the dysenteric symptoms appear somewhat tardily, but persist for a long time. In the fourth class the cases are choleric in character, and in a number of instances have been considered as cases of true Asiatic cholera. The fifth class includes the very numerous cases of undoubted typhoid fever, of which the outbreak at Wesleyan College in 1894, so completely and scientifically investigated by Conn, is the most conspicuous illustration.

Regarding the common notion that oysters at the breeding season are poisonous, attention is called to the fact that cases ascribed to this supposed influence may be otherwise explained, and that the people in the neighborhood of oyster beds eat them habitually at all seasons without injury. Thorough etiological research in every case of oyster poisoning investigated has shown that the oysters came from beds contaminated by sewage matters. But two explanations are possible in cases of poisoning by mollusks: they are due either to a toxic substance or to bacteria in the tissue of the mollusk or in the water between its shells, and the remote cause is always sewage contamination.

The bacteria of cholera and typhoid fever, the *B. coli communis*, the *proteus vulgaris*, and other organisms have been found in oysters from contaminated beds. The presence of the colon bacillus should always arouse suspicion and induce improvement in the management and supervision of the beds. Chantemesse has shown that oysters immersed for twenty-four hours in salt water contaminated with typhoid dejections or cultures and kept unopened for a day after removal will yield the organisms of the disease. According to Boyce, the typhoid bacillus does not grow in the tissues of the oysters, but disappears in from one to seven days after the oysters are placed in pure sea water; but, according to Foote, under conditions of continued immersion in contaminated water they multiply in the tissues during the first two weeks and then diminish, but can still be found after thirty days. In the opinion of Mosny the usual period of eight days in pure sea water is sufficient for their disappearance. The cholera organism has been found by Klein four days after removal of the oysters from water purposely contaminated with them, while De Giaksa has found them to be destroyed in from six to forty-eight hours. The bacilli of anthrax have been known to retain their vitality in sterilized sea water for twenty-five days, and the spores even as long as nineteen months. The *staphylococcus aureus* appears to have a vitality equal to that of anthrax bacilli. The *proteus vulgaris*, the pneumococcus of Friedländer, and certain other pathogenic organisms have been found active after forty days.

The two most important causes of unsanitary conditions of oyster beds are proximity to the mouth of rivers and the vicinity of seaports. Rivers are likely to undergo a process which we know as self-purification, which rids them after a time of pathogenic germs thrown into them with sewage. This purification of streams is susceptible of considerable modification through the influence of the sea, which at times interferes seriously. It is necessary for the best sanitary condition of beds situated at the mouth of rivers that the water of these rivers be sufficiently purified at that point in its flow where marine influences make themselves felt. No general law is equally appli-

cable to all rivers, and, therefore, it is necessary to determine in each case the average degree of purification at the boundary line of the zones of land and marine influence. Beds situated at the mouth of rivers flowing into seas in which tides are either absent or insignificant in their influence, such as the Baltic and Mediterranean, can be considered as free from possible contamination only when so far removed from sources of pollution that the currents, whatever their direction, cannot carry contamination to them. This distance varies widely according to the various local conditions of currents, prevailing winds, and force thereof, etc., and must be determined in each case. In the case of beds situated at river mouths where there is tidal influence it is important that sewers should not empty themselves into the river excepting during the first half of ebb tide, since it is important that the sewage shall be carried out to sea before the flood tide shall have an opportunity to bring it back again; and it is important that the beds shall be laid out above the level of low water in such a manner that they will remain uncovered during the latter half of the ebb and during the first half of the flood. When the beds are not situated in the channel of the river itself, but in its banks, it should be required of the proprietor that he shall not allow the river water to enter the beds excepting at high tide or during the hours of ebb tide when the sewage thrown into the river is below the entrance to the conduits by which water is admitted to the beds.

It is, of course, very evident that these general rules must be modified according to each case, since the conditions of contamination and purification vary according to the distance from the sources of pollution and according to the nature and degree of contamination, the size of the estuary, the situation of the beds, the zone of influence of the tide, etc.

Many of the English beds are notoriously contaminated. The installation and management of the English oyster beds situated near river mouths should not, as a rule, be regarded as models. The French beds are far more satisfactorily placed, though with certain of them the surroundings are not beyond improvement. In all cases of pollution the source of the contaminating matters should, when possible, be suppressed; when this is not possible the beds should be removed. Beds in good sanitary locations and condition must be protected against any possible cause of pollution.

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A CASE OF LIGATURE OF THE ABDOMINAL AORTA JUST BELOW
THE DIAPHRAGM, THE PATIENT SURVIVING FOR
FORTY-EIGHT DAYS; WITH A PROPOSED IN-
STRUMENT FOR THE TREATMENT OF
ANEURISMS OF THE ABDOMINAL
AORTA BY TEMPORARY
COMPRESSION.¹

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VINCENT T., aged fifty-two years, married, and a laborer, was admitted to the Jefferson Medical College Hospital under the care of Prof. James C. Wilson, November 8, 1899.

Family History. His father and mother died at about seventy years from unknown causes; one brother is living and well, and one sister died of pneumonia at fifty-seven years; there is no tubercular history.

Personal History. He had measles during childhood; has never had scarlet fever, diphtheria, nor typhoid. He had an attack of left-sided pleurisy twenty years ago, which was followed by a good recovery. There is probably a syphilitic infection.

His present trouble began about two months before admission, when he had an attack of severe pain in the epigastric region, radiating to the back. The pains varied a good deal in their intensity. On admission he had constant pain in the epigastrium, his bowels were constipated, and his appetite poor. The urine was clear, straw-colored; specific gravity 1020; reaction acid; neither albumin nor sugar was present; urea 1.5 per cent. By the microscope there were crystals of oxalate of lime, amorphous urates, a few epithelial cells, no pus, blood, or casts. His radial arteries were not noticeably atheromatous.

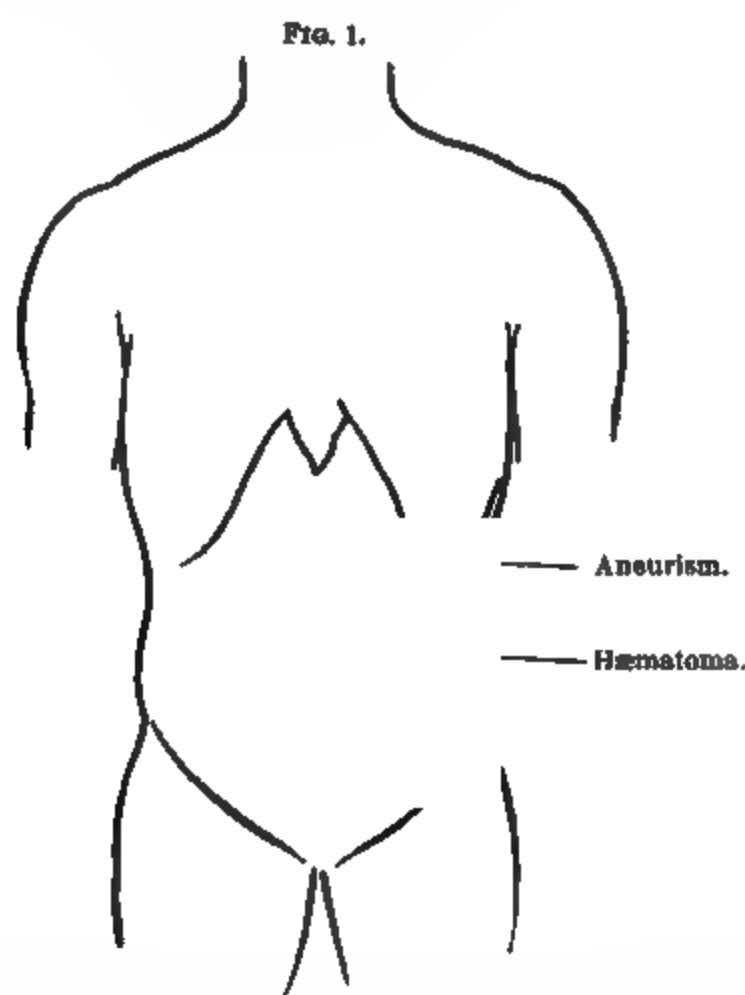
Prof. Wilson asked me to see the patient with himself, to consider the question of operative interference.

Physical Examination. His general condition is poor. There is a small bed-sore over the sacrum and coccyx. The viscera of the chest

¹ Read at the Thirteenth International Medical Congress in Paris, August, 1900.

are normal, and also the viscera of the abdomen, with the following exception: Half-way between the ensiform cartilage and the umbilicus (Fig. 1) is a tumor nearly 7 cm. in diameter. It is globular, perceptible to the eye, as it slightly raises the anterior abdominal wall. On palpation a distinct expansile pulsation is perceived, and there is a distinct bruit on auscultation. Unfortunately, I did not observe whether the bruit was propagated in the line of the aorta downward. The diagnosis of aneurism was made, and Prof. Wilson and I thought it to be a case suitable for wiring and electricity if, on exploratory operation, it was found practicable to reach it. On proposing this to the patient he rejected operation and left the hospital.

November 22d, five days later, he was brought back to the hospital in the ambulance, complaining of great pain in the left side of the abdo-



Site of the aneurism and the hematoma resulting from its rupture.

men. Examination showed that the entire left side of the abdomen from the lower border of the ribs to the left iliac region, and extending about 3 cm. to the right of the middle line, was occupied by a large, soft, smooth, elastic tumor. (Fig. 1.) His condition was very alarming; he was almost in collapse. His pulse was very weak, and it seemed as though he could scarcely survive. Under small doses of alcoholic stimulants, rest, and frequent liquid food he gradually recovered, so that he was in a condition for an exploratory operation. Evidently the aneurism had ruptured, and I feared a fatal hemorrhage if nothing was done.

Exploratory Operation, November 29th. An incision was made at the outer border of the left rectus. As soon as the abdominal cavity was opened a mass of almost the same color and consistence of the spleen

appeared in the wound. A few minutes' exploration showed the descending colon to the right of this mass. It was then clear that a large retroperitoneal hemorrhage had taken place from the aneurism, and that the large, dark mass was an immense hæmatoma under the external layer of the mesocolon. This was confirmed by thrusting a grooved director into the mass. I introduced my hand toward the epigastrium, and could seize in the palm of the hand the aneurism, which had not changed its shape or size to any notable extent. That it was connected with the aorta was evident.

In view of the condition of the man, the size of the clot, and the certainty of enormous hemorrhage if I removed the clot, I closed the abdominal wound. During his first stay in the hospital, and for the two days prior to the operation, his temperature had ranged from about 97° to 99° F. The day after the operation the temperature rose to 101.2° F. and then fluctuated from about 99° to 100° F., falling to the normal by December 2, the third day after the operation. The abdominal wound healed without incident, and the man's general condition improved from day to day. Prof. Wilson and I then determined to try the effect of hypodermatic injections of a 2 per cent. solution of gelatin in sterile normal salt solution. Injections were made December 4th, 5th, 11th, and 16th, of 48 c c. each.

No effect followed these injections, and as his condition was certainly growing no better, and he agreed now to a second operation, this was determined upon. Our intention was to wire the sac and use electricity; but the facts found at operation led me to ligate the aorta.

Second Operation. Ligation of the Abdominal Aorta, December 12, 1899. An incision was made in the median line, 8 cm. long, and was finally prolonged up to and alongside of the ensiform cartilage and down to the umbilicus. As soon as I had torn through the omentum in order to reach the aneurism the pancreas presented itself, lying only 2 to 3 cm. posterior to the abdominal wall. The entire pancreas had evidently been lifted up and thrust forward by the aneurism. Passing my hand in above the pancreas, between it and the stomach, I readily found the aorta. On each side of it the pillars of the diaphragm were at once felt. The working space above the aneurism was 5 to 6 cm. There were no evidences of atheroma or of other disease in the aortic wall. In view of the apparent possibility of the ligation of the aorta, I decided to attempt it, as a fatal result was inevitable, if nothing was done. First, with the left forefinger, I tore through the tissues on each side of the aorta, and in doing so distinctly felt some of the fibres of the pillars of the diaphragm give way. I readily separated the vena cava from the aorta, and so had the aorta isolated on both sides. With a long-handled aneurismal or pedicle needle with a large curve to my left I then passed four strands of disinfected floss silk from the left side of the aorta to the right. I passed the needle toward the vena cava rather than from it, because my left forefinger protected the vena cava from injury, and I felt that this was much less dangerous than passing the needle in the opposite direction. Then came the greatest difficulty, namely, the finding the eye of the needle and disengaging the thread. The working space between the aneurism, which was fixed below, and the border of the ribs, stomach, liver, and diaphragm above, was so contracted that though I could feel the point of the aneurism needle I could scarcely get access to it in order to seize

the threads with forceps or other instruments or even to see the threads. Accordingly I made a transverse incision, about 4 cm. long, to the left. This incision did not divide any artery which could be recognized as either a continuation of the internal mammary or superior epigastric. It added, however, less to the ease of the manipulation than I had hoped. I should certainly not recommend it in another case lest it should interfere with the re-establishment of the circulation. Finally, with great difficulty, by energetic retraction of the tissues, I was able to see the thread and disengage it from the needle. I then tied the aorta, one assistant having his hand on the aneurism and another on the left femoral. When tied, pulsation ceased in the femoral, but we were much less certain of its cessation in the aneurismal sac. It was very difficult to distinguish between true pulsation in the sac and the push of the blood-current in the aorta above the ligature, which was transmitted to the sac with each beat of the heart. Finally, however, we were convinced that pulsation had ceased in the sac. As soon as the ligature was tied the man's head, face, and neck became deeply congested and almost livid. This lividity gradually subsided in a few hours. In a few minutes after the ligature was tied the aneurismal sac had shrunk to less than one-half its original size.

The following observations were made by Dr. Harbaugh, who gave the ether: "Duration of anæsthesia, one hour and twenty-five minutes; 5 ounces of ether were used. He received once $\frac{1}{100}$ grain of atropine sulphate and, four times, $\frac{1}{20}$ grain of strychnine sulphate; he also received one enema of 2 ounces of black coffee and 1 ounce of whiskey. 2 P.M., anæsthetic begun. 2.10 P.M., pulse 100, weak, and easily compressed; $\frac{1}{20}$ grain strychnine sulphate hypodermatically. 2.30 P.M., $\frac{1}{20}$ grain strychnine sulphate hypodermatically. 2.40 P.M., $\frac{1}{100}$ grain atropine sulphate hypodermatically. 2.50 P.M., pulse 70. 3 P.M., pulse 90; $\frac{1}{20}$ grain strychnine sulphate. 3.10 P.M., ligature applied; pulse rose from 90 to 130. 3.15 P.M., $\frac{1}{20}$ grain strychnine sulphate; enema, coffee, 2 ounces; whiskey, 1 ounce."

During the entire operation the pulse was very irregular, weak, and easily compressed; respiration was regular and normal. Neither the splenic nor the portal vein was seen. No artery was seen. When the hand was first introduced I thought I could feel a large vessel beating above the point where the ligature was afterward applied, but this was probably an error. The abdomen was then flushed out with salt solution and closed. The legs, which were cold, were wrapped in cotton and surrounded with hot-water bags. Sensation was but little disturbed, and motion was not impaired.

December 20th, 8.40 P.M. Femoral artery was found to be pulsating very slightly. *22d.* Aneurismal bruit again slightly perceptible. The legs had regained their natural warmth. *24th.* An attack of moderately acute cystitis. *25th.* Superficial stitches removed. *27th.* Pulsation of the internal mammary and deep epigastric probably felt. *28th.* The area of the clot on the left side of the abdomen was distinctly smaller.

By January 10, 1900, he was so much improved that he sat up out of bed for two or three days, to relieve the monotony of his prolonged stay in bed and to take pressure off his bed-sores; but I thought it dangerous to allow him to continue any exercise.

By January 28, 1900, the clot on the left side of the abdomen, instead of overlapping the median line by 3 cm, failed to reach the middle line

by 3 cm. The aneurismal bruit and distention were not so marked as before. The bruit could not be heard below the aneurism in the neighborhood of the umbilicus. The bed-sore, which existed when he entered the ward, had been dressed with pure bovine, and was distinctly improved.

On January 9th, 48 c.c. of gelatin solution were again injected hypodermatically. As 48 c.c. gave him some pain, 24 c.c., which were not painful, were injected on the following dates: January 15th, 16th, 17th, 18th, 19th, 20th, 21st, 23d, 24th, 25th, and February 3d, but as no good result followed they were abandoned. On January 14th the tumor in the abdomen was carefully measured and found to extend from the tenth rib to the level of the anterior superior spine, and failed to reach the middle line by 6 cm.

On January 28th he had a marked chill, his temperature rising to 103° F. at 2 A.M.. At 9 A.M. it had fallen to 99° F. On the 29th at 8.45 P.M. another similar chill and an identical rise of temperature took place, and by the next morning at six the temperature had fallen to 98.6° F. On the 30th the plasmodium of malaria was discovered in his blood. The administration of quinine up to 25 grains a day, and then later in diminishing doses, prevented any repetition of the chill.

February 5th the patient complained all the afternoon and evening of pain in the region of the aneurism, radiating to the left groin and knee. His temperature also had risen a little above 100° F. On the 6th he was still doing badly. It was noted by Dr. Snell, the house surgeon, that the aneurism was apparently smaller. At 2 P.M. he rapidly grew weaker, the aneurism pulsated more freely, his pulse was very weak, his lips were blanched, and his expression anxious. Strychnine (gr. $\frac{1}{20}$) was given, and a saline enema with whiskey and external heat applied. At 3.20 P.M. he died.

The amount of urine passed before the operation varied from 19 to 40 ounces; but, as a rule, was small. After the operation he passed, on December 21st and the succeeding days until January 1 (eleven days), the following amounts: 12, 4½, 14, 21, 31, 21, 35, 40, 45, 39, 31 ounces, and after that his usual amount. Unfortunately, I did not examine it for albumin or other pathological changes. The kidneys were found to be normal at the necropsy.

Necropsy. On account of the circumstances of the case it had to be done hurriedly, as his family were clamorous for the body. It was limited to the abdomen and head. Unfortunately, the spinal cord could not be obtained. The necropsy was begun a half-hour after he died by Prof. H. F. Harris, Associate Professor of Pathology, and his report is as follows:

"Body of an emaciated male; skin pale and of a slightly yellowish hue. Mucous membranes likewise pale. Post-mortem rigidity has not begun. Temperature of the body almost that of the living person.

"In the abdominal wall there are three scars, one extending from the tip of the ensiform cartilage to a point just above the umbilicus; it is 1 mm. wide and 12.5 cm. long, and consists entirely of cicatricial tissue. Four centimetres to the left of the umbilicus there is a second scar, which extends from a point just above the umbilicus to the crest of the ilium; it is 17.5 cm. long and entirely healed. Running to the left from a point in the centre of the first scar referred to is a scar 4 cm. in length. It is also thoroughly healed.

"On cutting into the abdominal wall only a very small amount of adipose tissue is found. The muscles are rather pale, otherwise the wall presents no abnormalities. On opening the abdominal cavity great quantities of dark fluid blood and many clots are found. The omentum is adherent to the abdominal wall at the seat of the first scar. Beneath the scar last described several loops of small intestine are adherent to the abdominal wall; there is also a large tumor, which becomes apparent on opening the abdominal wall in this situation.

"The left pleural cavity is found normal on opening the chest. Scattered here and there are a few adhesions (evidently quite old) between the layers of pleura on the right side.

"Lungs are normal.

"On opening the pericardial cavity the lining membrane is found to be normal. Cavity contains 15 c.c. of fluid.

"Left side of the heart firmly contracted; right side empty and exceedingly flabby. Heart is rather small; it is in every way normal.

"Spleen is bound to all neighboring structures by old adhesions. Capsule is thickened, especially on its convex portion. The organ is slightly enlarged and its substance is tougher than normal. Weight, 175 grammes.

"Left adrenal is normal. Left kidney is normal in size and consistency, though perhaps slightly paler than usual. The capsule strips readily. Cortical and medullary portions normal. Weight, 140 grammes.

"The left ureter is pushed greatly forward and inward on account of a large tumor-like mass which occupies the left lumbar region.

"The tissues around the right kidney are intensely ecchymotic, and are much softer.

"Right adrenal is normal. Right kidney resembles in every way its fellow. Weight, 130 grammes.

"Right ureter is normal.

"On opening the bladder the mucosa of its posterior surface is covered by numerous rounded elevations, the largest of which are 1 cm. high and 1 cm. in diameter, the smallest being pinhead-like projections. These elevations are covered by a whitish deposit, which apparently consists of triple phosphates. On section, toward their free ends, these tumors are found to be of a dark, slaty color, but as the base of the tumor is reached this color gradually gives way to a grayish appearance. The tumor substance is well defined from the normal tissue beneath. The tumors toward their bases are encircled by a slight constriction, giving them the appearance of being somewhat pedunculated. The surrounding mucosa is bright red.

"The liver is small, weighing 1150 grammes. Its substance is soft and friable and rather pale in color.

"Pancreas is normal and weighs 118 grammes.

"Gastro-intestinal tract is normal.

"On removing the abdominal aorta this vessel is found to be entirely cut through at the point where it had been ligated, which is just below the diaphragm. (Fig. 2.) From this opening in the vessel blood had infiltrated downward into the tissues beneath the peritoneum, and had finally burst into the peritoneal cavity just over the right kidney. There had evidently been also some oozing of blood from the wound at the place where the vessel was tied. On dissecting further downward, 3 cm. below the point where the vessel is divided, an irregular, rounded

cavity was found on the posterior aspect of the aorta; its greatest diameter, which is longitudinal with the vessel, is exactly 2 cm. and the shortest is 3 mm. less. (Fig. 3.) The edges of this opening in the aorta are perfectly smooth, and are continuous on the inside with the intima of the bloodvessel and on the outside with the sac of the false aneurism about to be described. Just posterior to this opening, and extending 1 cm. upward from its upper margin and 5 cm. downward from its lower edge, is a rounded cavity that is flattened antero-posteriorly. This cavity is evidently the result of the opening in the aorta forming a false aneurism in this situation. The anterior wall of this sac is made up partially by the external coat of the aorta, which becomes continuous with the compact wall of tissue on either side, which forms the remaining part of the anterior boundary of the aneurism. This sac curves backward to the side of the vertebral column and be-

FIG. 2.

A

B

C

Site of ligature of aorta, viewed from in front.

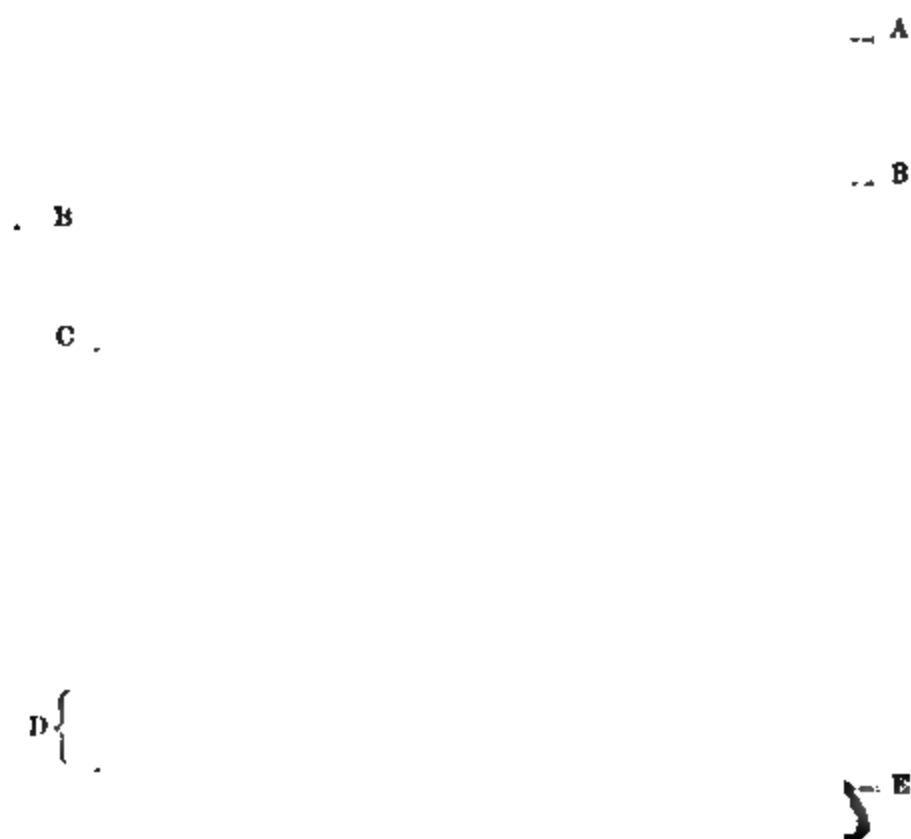
A. Edge of upper portion of the aorta. B. Edge of lower portion of the aorta. Between A and B is the place of ligation, followed by ulceration of the ligature completely through the aorta. C. The ligature as found at the necropsy.

comes continuous with the periosteum of the bones composing it. The bodies of the eleventh and twelfth dorsal and first lumbar vertebrae form the remaining part of the posterior part of the sac. The bodies of these vertebrae are deeply eroded, although the intervertebral cartilages are not affected. In all of its diameters, except antero-posteriorly, the exact measurement of which could not be determined, the diameters of this sac are 6 cm.; but as the antero-posterior diameter is but little less than the others it is, therefore, evident that the sac was almost round. The tissue forming the inner wall of the cavity is at all points quite dense—resembling fibrous tissue—and can scarcely be differentiated from the intima of the bloodvessel, with which it communicates. This sac has ruptured on its lower left side; the blood, penetrating into the muscle and tissues back of the peritoneum and infiltrating down to the

brim of the pelvis on the left side, has produced a tumor-like mass 24 cm. long and 6 cm. in diameter at its widest portion.

"It will be observed from the above description that there is no aneurism of the aorta itself, there being merely an opening in the posterior wall. The intima of the bloodvessel both in the region of the opening and above and below is in a remarkably good condition, considering

FIG. 3.



Aorta and aneurism seen from behind.

A. The opening in the aorta. B, B. Wall of sac of false aneurism. C. Opening where wall of sac ruptured. D. Large clot occupying left side of abdomen. E. Bifurcation of aorta.

the very extraordinary condition of the lesion just spoken of. There are here and there a few minute areas of what appears to be atheroma, and the intima is perhaps somewhat thickened, and shows a somewhat more irregular surface than normal. There are no clots found in the bloodvessel either above or below the point of ligation, nor were there any changes which indicate the formation of recent thrombi. This is

of much importance, in view of the fact that the vessel was eroded through the point of ligation.

"The dura of the brain appears to be entirely normal. The pacchionian bodies are present to an unusual degree on the surface of the brain. In some of the sulci the pia arachnoid appears to be slightly thicker than usual; this change is not a very marked one. The ventricles of the brain are normal. Substance of the brain is normal. None of the vessels, either of the meninges or the brain substance, appear to be in the slightest degree altered.

"*Microscopical Report.* Specimens from the kidney, liver, spleen, brain, sections of the tumors of the bladder, pieces of the wall of the false aneurism, and specimens from the abdominal aorta at the point where it opened into the false aneurism, from the point at which the vessel was tied, and pieces of the wall both above and below these areas were fixed in Heidenhain's solution, cleared in cedar oil, embedded in paraffin, sectioned, and the sections stained with toluidin blue alone, and with eosin, hæmatoxylin alone and with eosin, hæmatoxylin and picric acid, and by the methods of Weigert for fibrin, Unna for collagenous and elastic tissues, and by the method of Van Gieson.

"On examination the sections of the kidney are found to be practically normal, there being only in a few situations a very slight degree of interstitial change. Further than this no alterations existed.

"On examination but little change is found in the liver. There is, however, a slight degree of atrophy of the liver cells around many of the central veins of the lobules, and taking the place of these cells there are quite a number of lymphoid and plasma cells. There is in and between the liver cells in the vicinity of the alterations just referred to quite an amount of golden-yellow pigment. Around some of the fibrous septa which pass into the liver substance there are found here and there small collections of cells, these resembling in every way those occurring around the central veins of the lobules. The liver cells appear to be normal in other situations.

"Microscopical examination of the spleen shows a very marked thickening of the trabeculæ which traverse the substance of the organ. Around the edges of these trabeculæ, and in many instances lying entirely free in the splenic substance, there are found numerous perfectly typical plasma cells, while in addition there are many cells which, though resembling plasma cells in many particulars, do not exhibit the same affinity for basic dyes that is shown by the true plasma cell; these peculiar cells correspond to what are called by some writers atypic plasma cells. No other alterations of any moment are found.

"Microscopical examination of sections of the brain show the substance and the membrane to be entirely normal.

"Bladder: Sections of the tumors of the bladder prove to be of very unusual interest, inasmuch as they reveal the fact that the neoplasms are myxomata—tumors which are exceedingly rare in the bladder. Around their edges these tumors are covered by almost normal bladder epithelium, but on passing upward toward their apices this coat at some points always becomes detached from the basement membrane and hangs loosely in the interior of the bladder; beyond this point no epithelium is, as a rule, present; but occasionally in one of the depressions, which are quite numerous on the surface of these tumors, a few epithelial cells may be found. In the majority of the tumors no very marked change

is observed in the tissues which are exposed to the contents of the bladder, there being only a mild degree of cellular infiltration along the edges, and always considerable enlargement of the bloodvessels which are here present. In other instances the superficial structures that are uncovered by the epithelium have undergone necrotic change, and may be seen lying above and still attached to the living tissues beneath. In both instances, though especially in the latter, the mass of cells which is collected along the borders of the inflamed tissue presents the characteristic peculiarities of the polymorphonuclear leucocyte, but mixed with them are always a number of lymphoid and plasma cells. Along the edges of the tumor multitudes of bacteria are found. A little deeper down there are much larger collections of lymphoid and plasma cells, the latter being especially large and numerous; they occur in greatest number around the bloodvessels. At this point large, stellate, basophilic bodies are observed, and, becoming more numerous the deeper the tumor is penetrated into, they finally make up quite a large part of the tissues which lie toward the bases of these new-growths. These bodies contain several feebly staining nuclei, with distinct nucleoli, and though exceedingly irregular in form, vary in diameter from about 5 to 15 or 20 μ . Their protoplasm gives the iron reaction. They are evidently cells that have become swollen, and within their protoplasm there has been elaborated some substance which is intensely basophilic. Between these bodies there is a delicate stroma consisting of collagenous and elastic tissues. Between the bundles of this tissue are numerous spaces which contain connective-tissue cells, a quantity of a finely granular acidophilic substance, and also quite an amount of fluid. This tissue extends downward into the wall of the bladder only a short distance, but more or less separates the bundles of muscle-fibres in the most superficial portion of the muscular wall of the viscus. As before mentioned, these tumors undoubtedly belong to the class of myxomatous new-growths, but contain a certain amount of fibrous and elastic tissue.

"The inner wall of the aneurism is made up of more or less altered collagenous tissue, in the interstices of which there are breaking-down red blood-cells, a few polymorphonuclear leucocytes, lymphoid, plasma, connective-tissue cells, and quite a number of typical giant-cells, the protoplasm of which is intensely basophilic. The cells in these situations show their usual staining peculiarities, but the connective tissues have become decidedly basophilic. In some situations, in the interspaces between the fibrils of the connective tissue, there is a peculiar, entirely homogeneous substance which appears greenish in the specimens stained with toluidin blue and eosin; this substance frequently entirely surrounds the cells, but does not interfere with their staining reactions. Somewhat deeper the connective tissues begin to react in a normal manner to aniline stains, the number of cells, except the connective tissue ones, becomes gradually less and less, the peculiar homogeneous substance referred to is no longer found, and at a somewhat greater distance the tissues are found to present an entirely normal appearance. It may be mentioned as a rather interesting fact that the connective-tissue cells that lie in this connective tissue are much elongated, and that their long axes are invariably parallel with the lining of the aneurism; this is undoubtedly an effect of pressure.

"On tracing the lining of this aneurism to the opening in the aorta it is found that there is no well-marked point of union between the tissues

composing this and those which make up the wall of this bloodvessel—the tissues gradually merging into each other. As the point is reached where the opening exists it is found that while the superficial tissues of what is now a part of the wall of the aorta show a basophilic reaction, the muscle-fibres which lie at a lower level present that peculiar modified basic reaction which is seen in the granules of mast cells (mucin reaction). As the turn is made into the aorta itself both of these appearances just described gradually give way to those which characterize the normal appearance of this vessel.

“A careful examination of sections of the aorta both above and below this opening shows that an exceedingly small amount of change is present in the vessel. Here and there, however, are found slight thickenings in the intima, due to an increase of fibrous tissue, and, in addition to the cells which are normally present in the part, there are, as might be expected, quite a number of lymphoid and plasma cells. In the muscular coats there are also small areas in which the muscle-fibres present the mucin reaction; further than this no change is found in the vessel.

“Specimens from the aorta taken from the point where it was cut through by the ligature show surprisingly little change. In this situation the edges of the vessel present a ragged, irregular surface, and in the depressions between the more elevated portions small collections of blood are seen. At a distance of about 0.5 mm. from the end of the vessel where cut through, and in its muscular wall, there is quite a collection of lymphoid and plasma cells and polymorphonuclear leucocytes, and the tissues in this area have been to quite a marked degree replaced by them. At one side of this collection of cells there are found a few cocci which stain by Gram's method; in addition there are some forms which have the appearance of short bacilli; but these may be nothing more than several cocci lying close together, which seems not improbable.

“These bacteria are entirely surrounded by the wall of the bloodvessel, and evidently were not present at any other point; this accounts for the fact that cultures made from the vessel and from its contents remained sterile. These bacteria certainly exerted no influence on the cutting through of the aorta by the ligature.

“The tissues around the vessel and in the vicinity of where the ligature was placed show a slight degree of swelling, and in addition there are found here and there small collections of plasma cells and a few lymphoid cells; further than this no change is observed.

“In conclusion, it may be said that while a very slight degree of atheromatous change is undoubtedly present in this aorta, the alterations are not so great as are very commonly found in the vessels of old people in whom there has never been the slightest tendency toward aneurismal dilatation of the vessels, and, therefore, the mechanism of the development of the original aneurism, which must have preceded the false one, is by no means so clear as would be desirable. However, in the absence of any other probable cause, it seems necessary to assume that the condition was the result of a particularly severe patch of atheromatous change occurring only in the situation where the opening in the vessel exists, and where a very small aneurism must have developed before the wall of the artery gave way.”

Before making any remarks I add a brief *résumé* of all the recorded cases of ligation of the aorta, including one by Tillaux, done since my own.

CASE I. (Sir Astley Cooper¹).—A porter, aged thirty-eight years, was admitted to Guy's Hospital, April 9, 1817, for an aneurism of the internal iliac artery, extending both above and below Poupart's ligament. It was, apparently, the result of a violent blow upon the left groin thirteen months prior to admission. Three days later the tumor doubled in size. Compression by a tourniquet was applied. This soon produced a slough, and on June 20th he had an external hemorrhage; again on the 22d, the 24th, and the 25th hemorrhages occurred, the last one being so severe that it seemed as though he would not recover. At 9 P.M. on June 25th the aorta was tied by a transperitoneal operation. The incision was in the linea alba, three inches long, half above and half below the umbilicus. The aorta was tied with a single ligature and the ends left long. Immediately after the operation touch on the right thigh was appreciated as a touch on the foot. The pulse was 144 at the time of operation. By one o'clock in the morning, three hours after the conclusion of the operation, the lower extremities were regaining their heat. Other parts of the body were covered with cold sweat. He was treated with opium and external heat. At noon the next day the temperature of the right leg was 94° F., that of the left 87.5° F. Incontinence of feces set in that evening, and incontinence of urine, of which he had passed almost none, began during the day of the 27th. The left leg was still livid and cold. He gradually sank, and died at 1.18 P.M., having survived the operation forty hours.

The *necropsy* showed no peritonitis, excepting at the edges of the wound, which were glued together. The ligature was applied three-quarters of an inch above the bifurcation. Above the ligature was a clot more than an inch in extent, and below there were two clots extending into both iliac arteries. (Figs. 4 and 5.)

In his remarks on the case Sir Astley says that Mr. Lawrence has proposed that the silk ligature should be cut off close to the knot, but he adds "it has occurred to me that catgut would answer the purpose better," on the ground that as it is an animal ligature it would be more easily absorbed. He then relates the case of a man, aged eighty years, who had a popliteal aneurism and whose artery was tied with catgut, both ends being cut short. The wound was not dressed until the fourth day, and was then found to be completely united.

CASE II. (J. H. James²).—A man, aged forty-four years. Case first thought to be hip-joint disease, there being no tumor; but later an enlargement appeared and diagnosis of aneurism made. Operation, June 2, 1829. Ligation of femoral half an inch below Poupart's ligament. On account of extensive sloughing transperitoneal operation on the aorta was resorted to July 5, 1829, 3.30 P.M. Incision in median line. Aneurism needle broke at the wooden handle in consequence of difficulty of inserting it behind the aorta. Great difficulty in passing the ligature around the vessel. When the ligature was tied the patient complained of "deadness in the lower extremities." The ligature was cut close. Great pain in both legs followed, especially on the aneurismal side, and continued until he died, at 7 P.M., three and a half hours after operation.

Necropsy the next morning at ten. The tumor was collapsed. In

¹ Cooper and Travers' Surgical Essays, Parts I. and II., p. 83.

² Medico-Chirurgical Transactions, 1830, vol. xvi., Part I.

FIG. 4.

Sir Astley Cooper's case. Anterior view.

a, a, aorta; b, its bifurcation; c, c, iliac arteries; d, superior mesenteric artery; e, e, renal arteries; f, duodenum; g, ligature; h, clot in left iliac artery.

FIG. 5.

a

a

Sir Astley Cooper's case. Posterior view.

a, a, aorta; b, its bifurcation; c, c, iliac arteries; d, d, duodenum; e, ligature; f, clot above the ligature; h, clot in left iliac artery.

the abdominal cavity there was a considerable quantity of blood, partly coagulated. This may have proceeded from a vessel in the abdominal wall or a vessel in the mesentery scratched by the broken needle. The point of ligation was five lines below the inferior mesenteric and eleven lines above the bifurcation. The sac was filled with laminated clot and some grumous blood. Some diseased spots in the aorta and clots both above and below the ligature. He says: "The great difficulty I experienced in this case arose from the tough investment of the artery, which I could hardly pierce with my nail."

CASE III. (Murray¹). — A man, aged thirty-three years, admitted to the Civil Hospital, at the Cape of Good Hope, January 22, 1834, with a tumor in the right iliac, hypogastric, and inguinal regions. It probably had existed for eight months. No pulsation was perceptible in the femoral artery. Pain was often very excruciating. The limbs were swollen and flexed. The skin was insensible to touch, especially on the inner part of the thigh; temperature 5° below the opposite one. On the 26th he was seized with agonizing pain, and his general condition was much worse. The leg had become quite cold and insensible. The tumor was evidently on the point of rupture. After friction with stimulating liniments the limb became warm again by the afternoon, but the integuments of the foot were of a bluish color. The only possible operation was deemed a ligature of the aorta.

At the time of the operation (11 P.M.) the integuments of the instep and part of the leg were discolored, and the limb was again cold; pulse 120. Operation, January 26, 1834, by candle-light. Extraperitoneal operation. The most difficult part of the operation seems to have been the division of the membranous sheath covering the aorta, which was done chiefly by the finger-nail. At the time of ligation there was no noticeable alteration in the pulse; no congestion of the head. The tightening of the knot did not seem to give the patient any unusual sensation or shock [this was before the introduction of anæsthesia]. His first complaint was that his left leg had become as benumbed and useless as his right, and they had "done him a bad service in laming his good leg." Both ends of the ligature were cut long and hung out of the wound. He was able to move both legs fifteen minutes after the operation. Very soon a painful sensation of distention of the bladder was complained of. One ounce of urine was removed by the catheter, but the sensation was not relieved. His incessant cry for more than an hour was "my bladder will burst; why do you not pump my water off?" By 2.30 P.M. there was violent headache, with great beating of the carotid, while his pulse was scarcely perceptible at the wrist. The livid discoloration in the right leg had increased. At 5 P.M. it is noted that both legs continued "dead cold" in spite of external heat. He died at 9.50 P.M., twenty-three hours after operation.

Necropsy. An injection was thrown into the thoracic aorta and the body examined ten hours after death. There was no peritonitis. The bladder was vesicated on its internal surface and its coats considerably thickened. The left ureter, not injured at the time of operation, was dilated to the size of the little finger. The aorta was tied three to four lines above the bifurcation and one inch below the inferior mesenteric. (Fig. 6.) A small clot of blood existed above the ligature; none below.

¹ London Medical Gazette, 1834, vol. xiv. p. 68, and 1835, vol. xv. p. 6.

The immense aneurismal sac was filled with concentric layers of coagulated lymph and loose coagula of dark, thick, brown sanies. The iliac and psoas muscles were almost putrid, and the sac itself gangrenous in part. Murray points out that he believes the patient did not die from the ligature of the aorta, but "solely by the effect of his disease," as was shown by the gangrene and constitutional symptoms. He points out the fact that in a case of aneurism it is doubtful whether the operation will ever succeed, as the patient "must be so far advanced in danger before he could with propriety be advised to submit to a remedy attended with such imminent risk." He adds, however, that very possibly in cases of wound it would have a much better chance of success.

FIG. 6.

Murray's case.

a, aorta; b, inferior mesenteric artery; c, ligature on the aorta; d, right internal iliac artery; e, probe in external iliac artery (upper end); f, femoral artery; g, crural nerve; h, h, imaginary line representing Poupart's ligament; i, probe in external iliac artery (lower end); k, layers of sac held open by quills; l, between these two points gangrene had commenced.

CASE IV. (Monteiro).—A man, aged thirty-one years, in perfect health. In July, 1842, after a long horseback ride, he began to feel excessive pain in the right groin. On examination he felt a tumor. The tumor rapidly increased and the pain became more severe, so that he consulted Monteiro on July 28th. A diagnosis of aneurism of the external and common iliac artery was made. Operation, August 5, 1842, 2 P.M. Extraperitoneal operation. One end of the ligature was left long. The operation lasted an hour and twenty minutes. The legs were cold; patient showed slight sweating and dyspnoea. By 6 P.M. the legs were no longer cold, but even warmer than before the operation. Thirst was intense, and the dyspnoea was less pronounced. On the third day the pulse was perceived in the femorals. He made a very excellent operative recovery. At the end of a week pus began to escape

¹ Rev. Méd.-Chir., 1852, vol. xi., p. 147; Lancet, 1842, vol. i., p. 384; and Schmidt's Jahrbuch, 1843, vol. xxxvii., p. 85, and 1852, vol. lxxv., p. 337.

from the wound. On August 14th there was hemorrhage at the point where the ligature protruded. This was followed by a number of hemorrhages. At 10 A.M., August 16th, he died, as a result of the repeated hemorrhages, ten days and twenty hours after operation.

Necropsy twenty-five hours after death. The wound was entirely closed except where the ligature protruded. The aorta was tied four lines from its bifurcation and one inch below the inferior mesenteric. The tumor contained nearly six pounds of coagulated blood, some of it laminated. Below the point of ligature there were some clots; above it there were none. The clots in the inferior portion were, however, small and incompletely obliterated the vessel. The knot of the ligature had perforated the aorta.

CASE V. (South).¹—June 21, 1856, 2 P.M. A man, aged twenty-eight years. Point of ligation a little above the bifurcation for a large aneurism of the right external and common iliac arteries. The aneurism rose above the umbilicus nearly to the cartilages of the ribs. Pulsation was felt with great difficulty. Distinct bruit by stethoscope. Sensation was lost in all of the right leg from pressure on the nerves. Extraperitoneal operation. The ligature was applied two lines above the bifurcation. This was the first operation under an anæsthetic. He died June 23d, 9 A.M., forty-three hours after operation.

Necropsy. The tumor was found to be a diffuse aneurism arising from the iliac artery.

CASE VI. (McGuire).²—Aneurism of external iliac. A man (negro), aged thirty years, while chopping wood, felt something give way in the lower abdomen a week before admission to the hospital. The tumor, about the size of a goose-egg, was in the left iliac and hypogastric regions. The pain was severe and increasing. Compression of aorta at intervals throughout the day and night of March 26th. This could be borne only for a few minutes at long intervals. After two or three hours the pain was so great that it had to be abandoned. Diarrhoea and fever; great tenderness and heat in the tumor. Operation, March 30th, 1 P.M. An attempt was made to ligate the common iliac. Extraperitoneal operation. Collateral circulation was already established, so that a large number of vessels required ligature. The condition found led McGuire to tie the aorta. In order to reach the aorta the tumor was caught between the finger and thumb; but in spite of delicate handling the sac suddenly burst, and a profuse discharge of blood took place. The finger at once placed upon the aorta an inch above the tumor completely arrested the hemorrhage until an assistant had surrounded the vessel with a ligature and tied it. About one pint of blood was lost. In a few minutes after being placed in bed, the body, which had been cold, became warm. At 5 P.M. he complained of numbness in the legs. At 6 P.M. one ounce of urine was removed by catheter. 7 P.M., sleeping quietly; lower extremities warm; skin pleasant. 10.30 P.M., restless; by midnight the pulse could not be measured, and he died at 12.30 A.M., eleven and a half hours after operation.

Necropsy twelve hours after death. No blood in the abdomen. The aneurism involved the aorta from the origin of the inferior mesenteric to the bifurcation and the right common iliac to its division into the external and internal and the left common and external iliacs. The

¹ *Lancet*, 1856, vol. ii., pp. 47 and 222.

² *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, 1868, vol. lvi. (N. S.), p. 415.

ligature was at the origin of the inferior mesenteric, and included the left ureter, which was deeply embedded in the cellular structure of the aneurism. It was difficult, even at the necropsy, to dissect the ureter from the wall of the sac without opening the cavity of the aneurism.

CASE VII. (Watson¹).—Operation, August 6, 1869. Common iliac had been tied antiseptically nine weeks previous with catgut. Secondary hemorrhage followed, and the aorta was tied by transperitoneal operation with a silk ligature half an inch above the bifurcation. The external and internal iliac arteries on the diseased side were also tied. The patient did well for forty-eight hours, but began to sink after the sixtieth hour, and died sixty-five hours after operation.

CASE VIII. (Stokes²).—A man, aged fifty years, accustomed to carrying heavy weights, temperate in habit, and never had suffered from any constitutional disease. Three months before, March 4, 1869, when he was admitted to the hospital, a tumor was first noticed in the right groin. A diffused iliofemoral aneurism was diagnosticated two months later. The tumor occupied the right iliac and upper femoral regions, extending upward to within an inch of the umbilicus. Pulsation, fremitus, and loud bruit were present. Pressure was attempted, but the patient could not bear it. Operation, March 8th, 11.15 A.M., under chloroform. Extraperitoneal operation. The "chief difficulty in the operation," he states, was the separation of the peritoneum from the transversalis fascia. There was great difficulty from distention of the intestines. A Luer's needle was passed around the aorta just above the bifurcation, and attached to the ligature was a piece of silver wire, which was then drawn around the aorta. The ends of this wire were then seized in Mr. Porter's artery compressor and traction made on them until all pulsation and bruit had ceased in the artery. The ends of the wire were then secured to the ring of the clamp and the wound closed. Both legs were bandaged with flannel. The operation was almost bloodless. Hot-water bottles were tied to his feet and brandy and water given internally. The operation was concluded at 11.15 A.M. Fifteen minutes after the conclusion of the operation the pulse was 125, the color of the lips was good, and the temperature of the right leg and foot was lower than the left; no paralysis whatever; marked restlessness. Immediately after the operation he complained of paroxysmal pain in the ball of the great toe and sole of the same foot. At 2.30 P.M. the temperature in the left extremity was very good; right greatly improved. 9 P.M. pulsation of the left femoral had returned; in the tumor no pulsation or bruit. He died at midnight, about thirteen hours after operation.

Necropsy the next day. Aneurism of the right common and external iliacs and femoral. (Fig. 7.) The bone was partly eroded. In the tumor there was a considerable amount of coagulated blood and some recently deposited fibrin. The instrument was removed with the greatest facility. It was found that not the slightest injury had been done to any of the coats of the aorta. Before opening the aorta the point of compression was found to be water-tight. He calls attention to the fact that the collateral circulation can be established in a very few hours, and also that speedy consolidation of the contents of an enor-

¹ British Medical Journal, 1869, vol. II., p. 216.

² Dublin Quarterly Journal, 1869, vol. XLVIII., p. 1.

mously diffused iliofemoral aneurism can take place after occlusion of the aorta. The death in his case was caused by the shock of the operation in a person with fatty degeneration of the heart.

FIG. 7.

Stokes' case.

CASE IX. (Czerny').—A soldier, aged twenty-seven years, on August 4, 1870, was wounded four finger-breadths below the left Poupart's ligament. The thigh bone was not fractured. On the 11th a severe hemorrhage took place. Ligature of the femoral artery both above and below the profunda. On the 13th there was loss of sensation in the left foot. This yielded to hot applications and alcoholic stimulants. On the 19th another severe bleeding at the point where the artery was ligated. The lower ligature had cut through. The common iliac artery was then ligated after failure to secure the bleeding-point. The hemorrhage from the femoral became less, but was not arrested. Renewed attempts to tie the profunda resulted in failure. Extraperitoneal operation on August 19th at 9 A.M. Believing that, as he had not seen the

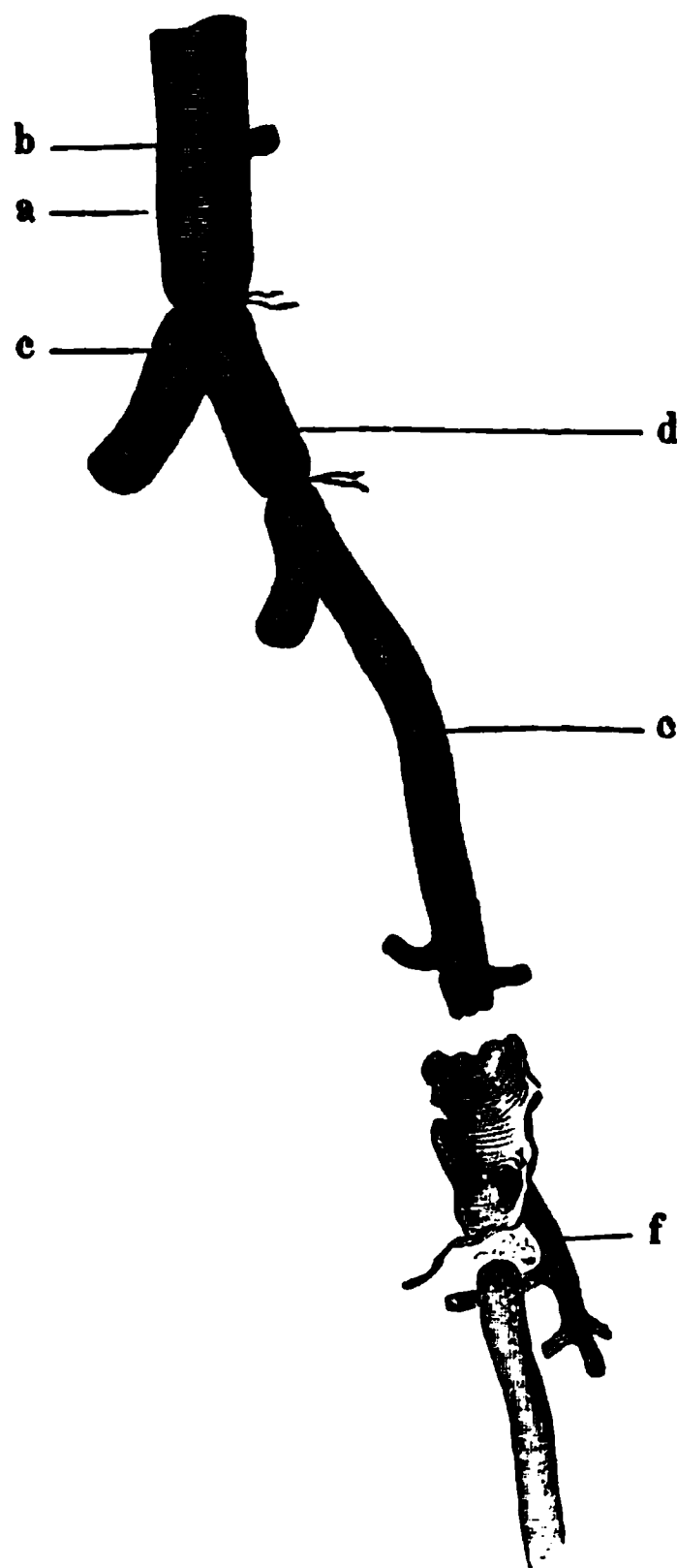
¹ "Bericht ueber die in Weissenberg behandelten Verwundeten." Wiener medicinische Wochenschrift, 1870, p. 1402, and 1871, p. 106.

division of the artery, he had probably ligated the external iliac and not the common iliac, he carried his incision a little further up, stripped off some more of the peritoneum, and found, about three-quarters of an inch higher, the division of the artery into two parts. "Although the thought came to me for a moment that the vessel which had been tied might be the aorta, this idea seemed so improbable that I did not examine the pulsation of the right femoral." One end of each of the two ligatures was cut short and the other brought out of the wound. In the afternoon his condition was hopeful; the pulse was 136; the injured leg, however, did not again become warm. The next morning at eight o'clock the left thigh was greatly swollen, discolored, and the whole extremity cold and dead; the right warmer, movable, and sensible. At 12 M. he died, twenty-seven hours after the beginning of the operation.

Necropsy. No peritonitis. [No mention is made of any antiseptics.] The two abdominal ligatures were found to be: the first, just above the bifurcation of the common iliac; the other on the aorta itself. (Fig. 8.) The ligature on the aorta was impermeable to water. At the ligature of the aorta there was only a peripheral thrombus. Death took place from acute sepsis and hemorrhage. The collateral circulation must have been re-established very soon, as in the right leg there was no visible disturbance of the circulation.

CASE X. (Czerny¹).—A man, aged fifty years. Large tumor of the left kidney. Operation, January 19, 1879. Coeliotomy. The outer layer of the descending mesocolon was divided and blunt dissection begun. It was soon found that the soft tumor mass had broken through not only the capsule, but the inner layer of the mesocolon. Very profuse bleeding occurred, which could be controlled only by temporary compression of the aorta. As soon as this was relaxed the hemorrhage began again. Accordingly the aorta was tied and the hemorrhage ceased. [The paper does not state whether the tumor was removed or the operation abandoned.] Two hours after the closure of the abdominal wound anæ-

FIG. 8.



Czerny's first case.

a, aorta; b, inferior mesenteric artery; c, middle sacral artery; d, common iliac artery; e, external iliac artery; f, profunda femoris artery.

¹ "Ueber Nierenexstirpation." *Centralblatt für Chirurgie*, 1879, vol. vi., p. 737.

thesia and paralysis of the lower extremities set in, and ten hours after the operation he died.

Necropsy. The renal artery was torn close to its entrance into the tumor. The ligature around the aorta lay diagonally between the two renal arteries, so that the right renal was not obstructed, but the left was entirely closed.

CASE XI. (Milton¹).—An Egyptian, aged forty-five years, admitted to the hospital July, 1890. For sixteen months he had had a pulsating tumor in the abdomen, with severe paroxysmal pain. He had had syphilis, but never received any injury. The tumor was the size of an orange, and lay a little above the umbilicus. An operation was planned by Mr. Milton as follows: "To incise the abdominal walls for about five inches in the middle of the linea alba, to expose and incise the peritoneum covering the aorta one inch above the aneurism, separate the aorta from the vein, and then pass a blunt director on either side of the vertebræ, and to force it gradually backward through the tissues until its point could be cut down on in the back; then to make a similar passage on the other side; then to pass a small drainage-tube along the two channels made by the director, forming a loop across the aorta, the two ends of the tube presenting in the back on either side of the vertebral column—the tube being in position, to close the peritoneum over it with catgut sutures, and finally to completely close the abdominal incision. The idea was to leave the patient a few days, and then to compress the aorta against the vertebral column by traction on the two ends of the drainage-tube. The amount of pressure to be applied and the period of its application were to be regulated by the effect produced on the patient." Before this could be done, however, July 3d, the patient awoke with severe pain, and the aneurism evidently had suddenly ruptured. The rounded tumor could no longer be differentiated, but formed part of a pulsating mass extending from the umbilicus into the whole left hypochondrium. The aorta was compressed until it was ligated eight lines above the origin of the aneurism. The effused blood was retroperitoneal. Duration of operation but twelve minutes. Death took place, at the end of twenty-four hours, of anæmia and shock. He had complained of intense pain and tingling in both legs up to the time of his death. Thirteen ounces of urine, free from albumin or blood, were passed.

Necropsy. Aneurism purely aortic; lower limit three-quarters of an inch above the bifurcation; upper limit an inch and a half below the renal arteries, both of which were above the point of ligation. Four pounds of blood were found behind the peritoneum. All organs were anæmic, but otherwise healthy. Kidneys normal.

CASE XII. is the case reported in this paper.

CASE XIII. (Tillaux¹).—A man, aged fifty-six years, who had suffered with an aneurism of the left iliac for a year. On January 20, 1900, it ruptured and produced a diffuse aneurism as large as an adult head and reached almost to the umbilicus. The common iliac, as was supposed, was tied as high as possible with a silk thread by the transperitoneal route. There was no pain nor circulatory disturbance afterward; no alteration of the sensibility; the temperature on the left side was 35.4° (C.), and on the right side it was 34.6° (C). After several

¹ Lancet, 1891, vol. 1., p. 85.

² Bull. et Mém. Soc. de Chir., Paris, May 8, 1900, p. 473.

days the tumor gradually increased in size, with a return of slight pulsation. He gradually grew thinner and showed evidence of venous congestion, with retention of urine. He died thirty-nine days after the ligation. The *necropsy* showed that the later phenomena were due to thrombosis of the femoral vein. The ligature, instead of being placed on the common iliac, as had been supposed, had been placed on the aorta immediately above the bifurcation. Nothing is said in this preliminary report as to the condition of the aorta above and below the point of ligation, as to the circulation in the other leg, the condition of the kidneys, or the spinal cord; but Prof. Tillaux has kindly informed me that there was no ulceration at the point of ligation. The aorta was not completely obstructed by the ligature, as a grooved director could be passed.

REMARKS. The remarks that I have to make can be best divided into (1) the remarks on the case herewith reported and (2) on the general subject of the cure of aortic or iliac aneurism by ligation of the aorta or other means.

1. *Remarks on the Present Case.* The first question that presented itself to me was whether the ligature had not slipped and failed wholly to occlude the aorta, as actually occurred in the able hands of Prof. Tillaux. This was especially suggested to me by the large loop which the ligature showed, as revealed by the necropsy (Fig. 2). In order to determine this positively I removed the loop of the ligature from the specimen and stretched it between two pins. The distance between the two pins was 21 mm. I then obtained a fresh aorta and ligated that as tightly as I could, and on removing the loop found that it measured 19 mm. between the two pins. This convinced me that the ligature did really occlude the aorta, for on comparing the fresh aorta with the specimen I found that the aorta from my patient was somewhat wider than the fresh one.

Additional evidence—the absence of pulsation in the femorals after the operation was concluded, and its *gradual* return, the absence of pulsation in the aneurism, which, as described, was somewhat difficult at first to determine positively, and the diminution in the size of the aneurismal sac—convinced me that the aorta was entirely occluded. It is also to be noted that when I tied the fresh specimen it did not pucker conically at the site of the ligature, but was folded over upon itself. This would increase remarkably the size of the loop.

The site of the ligation in reference to the branches of the aorta could not be determined with absolute accuracy from the specimen when I first saw it. It was certainly applied just below the diaphragm, as the pillars of the diaphragm were recognized at the time of operation. Whether above or below the coeliac axis was not quite certain, but it was surely applied above the renal and the mesenteric arteries. In view of the position of the ligature, it is remarkable that the post-

mortem showed no changes in the kidneys, and that the amount of urine passed, though much diminished in the first few days following the operation, was not much less than often follows any other operation.

I regretted very much that the necessary haste with which the post-mortem was made prevented the removal of the spinal cord and its microscopical examination. So far, however, as the clinical symptoms went, there was no marked change in either sensation or motion. The cutting off of the circulation produced a coldness in both lower extremities, which, however, soon passed away, and later the man was able not only to move his legs, but to get out of bed and even to walk with his usual strength. One very marked symptom was observed immediately after the ligation of the aorta—the very deep congestion of the upper portion of the body. This explained to me more forcibly than I had ever appreciated before the enormous dilating force of the blood-current and the means by which the collateral circulation is established.

In only three of the cases reported is the time given at which the femoral pulsation was observed to be re-established. In Stokes' case (VIII.) the femoral pulse was observed in ten hours; in Monteiro's case (IV.) on the third day, and in my own it was observed a little over five hours after the conclusion of the operation. Its early re-establishment, it seems to me, was probably due to the partial collateral circulation already in existence by reason of the aneurism. In Czerny's first case (IX.) the collateral circulation, as he says, must have been re-established very soon, as there was no visible disturbance of the circulation in the other leg. In 1864, in a case of ligation of the common carotid, I observed the re-establishment of the temporal pulse on the side of the ligation in five and a half hours after the operation.¹

The experiments upon animals by Sonnenburg² present some very remarkable results in reference to the collateral circulation after ligation of the aorta. First, a manometer was placed in the central end of the femoral artery, and the aorta was then compressed and finally tied. When digital compression was applied, or when the ligature was tightened, the blood-pressure fell gradually, but did not reach the zero. When the ligature was permanently tied the pressure *fell from 110 mm. of mercury to only 66 mm., but after 300 seconds began to rise again, and after 700 seconds pulsation was perceptible.* The manometer was then placed in the peripheral end of the femoral and the aorta tied. The pressure again fell, but not so quickly as in the first instance, and the pulse also returned, but at what time is not mentioned.

Kast³ also reports some experiments on animals in which he placed a manometer in the central end of the femoral of a goat. As soon as

¹ THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, July, 1864.

² Centralblatt für Chirurgie, 1876, p. 689.

³ Deutsche Zeitschrift für Chirurgie, 1880, vol. xii., p. 405.

the aorta was tied the pressure fell from 20 mm. not entirely to zero, and after only two or three seconds rose to 17 mm.

2. *Remarks on the Cure of Aortic Aneurism by Ligation of the Aorta or Other Means.* On reviewing the thirteen cases of actual deligation of the aorta in man in connection with the numerous experiments on animals which have been made on this subject, three propositions, it seemed to me, are well established.

(1) The human subject can survive after ligation of the aorta without serious mischief. Ten of the cases have died very shortly after the operation, but three of them have survived sufficiently long to establish the truth of this proposition. Monteiro's case survived ten days and twenty hours; Tillaux's case survived thirty-nine days, and my own case survived forty-eight days. These show distinctly that the collateral circulation can be established sufficiently early to preserve the lower limbs from gangrene and the cord from such changes as will produce a permanent paralysis.

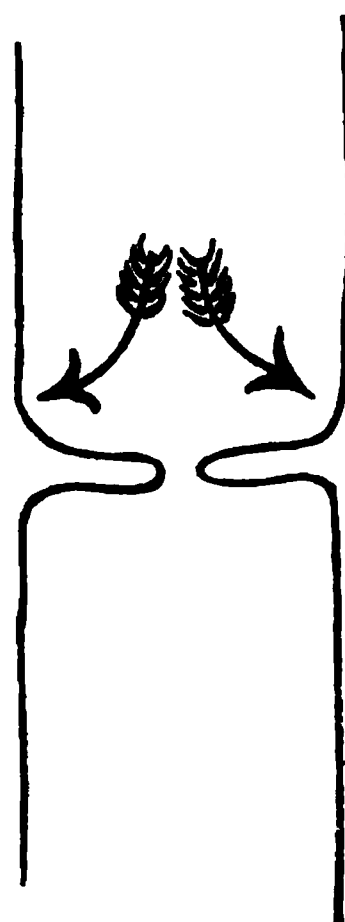
No certain conclusions can be drawn as to the effect of the ligature on the vessel in Tillaux's case, since the lumen of the vessel was not entirely closed, but Monteiro's case and my own show that with the ordinary ligature, whether single or multiple, death will almost certainly result from the cutting through of the ligature and secondary hemorrhage. The diagram (Fig. 9) shows the reason for this.

The aorta is very elastic. With each pulsation there must be marked dilatation of the vessels above the ligature, and this constant tugging must eventually result, in my opinion, in all cases in ultimate ulcerative absorption, rupture, and death.

I had in mind at first the substitution of a broad, flat band which would occlude the aorta over a considerable space, and thus mechanically avoid the cutting action of a ligature. A serious objection to this would be that the knot in any band, such as a piece of tape or a silk ribbon sufficiently broad to attain the object in view, would be very bulky, and instead of being absorbed would almost certainly give rise to trouble. This led me to devise the instrument which is described below.

We can also appeal for instruction to the considerable number of cases of occlusion of the aorta by either a thrombus or an embolus, referred to by Welch.¹ In this exhaustive paper Welch has collected

FIG. 9.



To illustrate the expansive tug on the ligature, necessarily causing its ulceration through the walls of the aorta.

¹ Allbutt's System of Medicine, American edition, vol. vii., p. 273.

fifty-nine cases of occlusion of the aorta. Fifty-six of these were followed by death, very commonly from gangrene. Even if the patient, therefore, should survive the shock of the operation, the chances of recovery would be but small.

(2) The treatment of aortic aneurism by temporary compression of the aorta by means of a tourniquet has given what may justly be called excellent results, especially as compared with ligation. This method, as is well known, was devised in 1864 by Murray,¹ of Newcastle-on-Tyne, who, for the first time, tried instrumental compression, and with entire success. The pressure was made through the abdominal wall by a tourniquet, first on April 16th for two hours, and on a second occasion, April 19th, for five hours, the patient being continuously under chloroform on both occasions. The circulation was not completely and permanently suspended except for the last hour of the second attempt. In Ashhurst's *International Encyclopædia of Surgery*, vol. ii., p. 928, which was published in 1889, Barwell states that ten cases had been reported up to that time, of which five were successful, four died, and in one case no cure was effected. Pressure was kept up in some of the cases for five, ten, and ten and a half hours. The cases that resulted fatally died as a result of *bruising of the intestines*, which could not be displaced from underneath the tourniquet.

I have not sought in the literature on the subject for any additional cases since that date, but the presumption would be that the mortality-rate would be about the same.

(3) The third proposition is that in suitable cases of aortic or iliac aneurism, in view of the safety from infection which our modern antiseptic methods give us, the abdomen should be opened and an instrument applied to the aorta which would suitably compress it, not with a view to the permanent obliteration of its calibre, but, following Murray's method, for a temporarily complete or almost complete occlusion of the lumen of the aorta. By its application through an incision injury to the intestines could be avoided with absolute certainty. The instrument should be so constructed that the compression could be regulated, relaxed, and renewed at pleasure; and, finally, when consolidation of the aneurism has been effected, the instrument could then be withdrawn and the abdominal wound closed.

In Milton's case the very ingenious plan which he devised, but was prevented from employing, was as follows: That the abdomen should be opened, the aorta isolated, and the two ends of a drainage-tube passing over and in front of the aorta should make their exit through two openings on either side of the spine. The two ends could then be tied and the pressure relaxed or increased as desired, the tube being

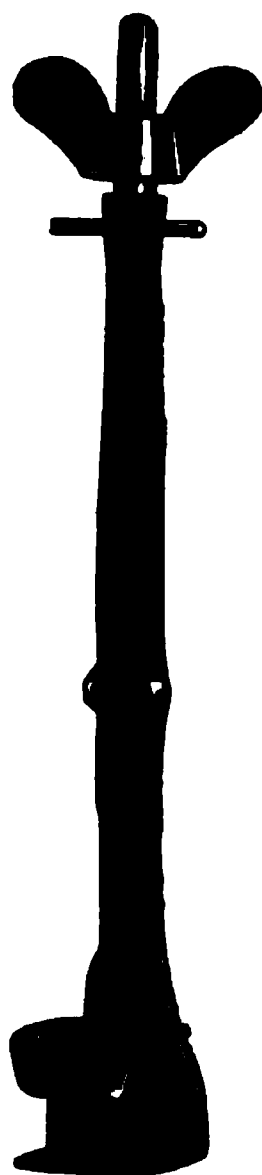
¹ *Medico-Chirurgical Transactions*, vol. xlvii., p. 187; *Lancet*, February 8, 1878, p. 193.

removed when the object had been attained. The two most serious objections which seem to me to lie against this plan are, first, that structures other than the aorta would be liable to injury, especially the thoracic duct, and, secondly, the possibility of infection and the more extensive injury, neither of which, however, need be taken too seriously.

The instrument that I have devised avoids the danger just alluded to—of pressure on the thoracic duct—and requires only the opening of the abdomen and its application to the vessel. It consists of two parts (Fig. 10): First, a shank with a horizontal plate, which passes at right angles to the shank behind the aorta. The aortic surface is slightly roughened, in order to prevent slipping. Secondly, a second shank, with another horizontal plate, which can be introduced separately and fastened to the shank of the first piece by slipping the narrowed portion under the two projecting teeth of the first shank. This upper horizontal plate is also slightly ribbed on its under surface and provided with a lip which overlaps the lower horizontal plate, the object of the lip being to prevent the slipping of the aorta from the grasp of the blades.

I have measured the human aorta, and find that when flattened out it measures about 36 mm. transversely. This would give the proper measurement for the width of the plates. In order to make the narrowing of the aorta a conical or gradual one, instead of the abrupt narrowing caused by the ligature, the sides of the upper horizontal plate shelve gently upward. For application to the human subject the length of the plates should be about 15 mm. in the horizontal portion, the shelving portion at the upper and lower border being about 5 mm. each. The length of the shanks or handles would be greater or less in accordance with the build of each patient. In a very stout person they would have to be much longer than in a thin patient. The instrument can be introduced either as a whole, or, probably more readily, in two parts, which are then fastened together by passing the narrow portion of the handle of the upper blade into the grasp of the two prongs or teeth on the handle of the lower blade. By means of the screw at the upper end the upper blade is now gradually approximated to the lower, and when an assistant, with his finger on the femoral artery, finds that the pulsation has disappeared, occlusion of the aorta would be complete. By means of the little crossbar and by unscrewing the screw the upper blade can be retracted to any desired extent. By this manipulation it is evident that the circulation can be absolutely arrested or can be reduced to any degree that is desired. By this means Murray's method of temporary compression can be adapted to the aorta for any length

FIG. 10.



of time desired, in accordance with the effect of the anæsthetic, the general condition of the patient, and the effect upon the aneurism. Indeed, I am not at all sure that the patient would have to be anæsthetized during the entire sitting. Very possibly when the aorta has been occluded the anæsthetic might possibly be withdrawn and only renewed when the instrument is to be removed. Experience may show that even this is not required. With the modern antiseptic methods I believe it would be possible to retain the instrument in position for two or three days and reapply the pressure at any time, removing the instrument entirely when the attempt has been either successful or would be best abandoned. In removing it, it might be removed as a whole, or, if desired, in two parts.

EXPERIMENTS UPON ANIMALS WITH THE INSTRUMENTS JUST DESCRIBED.

At my request Dr. J. C. Keeler performed the following experiments upon some dogs, in order to test this instrument. Female dogs were selected, so that the abdominal bandages might not be soiled with the urine. All the usual antiseptic care was taken, and each dog, after recovery from the chloroform, if there were any symptoms of pain, received suitable doses of morphine to relieve her. In each case, unless otherwise stated, the aorta was clamped just below the renal artery.

Experiment I. March 10, 1900, 4 P.M., small dog. The clamp was placed in two separate pieces on the aorta and tightened until complete obliteration of the femoral pulse was observed. The hind legs were found to be paralyzed as soon as the dog recovered from the anæsthetic. She was, therefore, slung with bandages. Respiration soon became rapid and shallow; all nourishment was refused, and six hours after the operation death ensued. The post-mortem showed the clamp in place 2.5 cm. below the renal arteries; the lungs were congested.

Experiment II. March 19, 1900, 3 P.M., large dog. The clamp was placed on the aorta as a whole instead of in separate pieces, and was then tightened until the femoral pulse had ceased. Six hours and a half later the femorals were pulsating strongly, and it was found that the clamp had slipped from the aorta. The clamp accordingly was removed in two parts and the wound closed. For two days the dog was partially paralyzed in the hind legs, but showed no discomfort, and soon was entirely restored to health. The slipping was due to the fact that the upper blade which clamped the artery had not a sufficiently long curved lip to prevent it from slipping. The lip was then slightly lengthened and the following two experiments performed with the modified instrument. I might add also that Dr. Keeler and also Mr. Schneyder, the instrument maker, had suggested several other minor improvements.

Experiment III. April 9, 1900, 3 P.M. The same dog as in Experiment II. The aorta and the part involved in the prior operation were found firmly bound down by adhesions. Accordingly the clamp was adjusted as a whole just above the bifurcation of the aorta. The aorta

was then compressed so as to obliterate the pulsation of the femorals. Twenty-four hours after the operation distinct pulsation could be felt in the femorals. How much earlier it had been present could not be determined. Forty-three hours later the clamp was tightened so as to obliterate the pulsation, and it remained in place until the one hundred and tenth hour. For the first four hours paralysis of the hind legs was noticed; after that time she walked with a tottering gait. Food was heartily taken, and everything looked toward a speedy and complete recovery. The clamp, however, became entangled in the bandages as an attempt was about to be made to remove it, the aorta was torn, and death ensued immediately.

* [In all probability the minor effects following the later entire occlusion were due to the establishment of the collateral circulation by the partial occlusion of the aorta at the first attempt.]

Experiment IV. April 20, 1900, 2.15 P.M. The clamp was placed in position in two parts and tightened so as to obliterate the femoral pulsation. Paralysis of the hind legs immediately followed. Three and a half hours later the clamps were removed, one blade at a time, the pulsation re-established, and the paralysis disappeared.

- The conclusions from these operations are: (1) that in dogs paralysis of the hind legs follows complete obliteration of the aortic stream; (2) that the paralyzed parts may regain their entire health even after forty-eight hours' compression; (3) that three and a half hours of compression will not interfere with the complete restoration of the paralysis; (4) that at least after twenty-four hours, and possibly less, the collateral circulation may re-establish the continuity of the circulation; (5) that the aorta may be clamped in the dog for one hundred and ten hours, and yet the collateral circulation be established sufficiently to nourish the posterior extremities; (6) that the clamp can be placed on the aorta, at least in the dog, either in separate parts or as a whole, and (7) that it can be readily removed without injury to the aorta.

GRANULAR DEGENERATION OF THE ERYTHROCYTES, AND ITS SIGNIFICANCE IN CLINICAL PATHOLOGY.

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IN making clinical blood examinations, my attention has for a year past been directed toward certain morphological changes in the red blood-cells, which, while easy to demonstrate, are yet of considerable interest in diagnosis.

It is well known that the changes which we find most frequently in the red blood-corpuscles, such as macrocytosis, microcytosis, polychromatophilia, and the presence of nuclei in the red cells have generally no single significance; that is, without further knowledge we cannot determine whether these changes are regenerative or degenerative in character. Poikilocytes alone can safely be considered to be products of degeneration and to show an anæmic condition of the blood.

Under these circumstances it is an interesting fact that we have recently learned to recognize another change in the red cells, the appearance of fine granules in the corpuscles upon the addition of a basic dye. This change is undoubtedly to be considered degenerative.

To demonstrate these granules, specimens are thus prepared: the drop of blood, spread in the usual way in a very fine film upon the cover-glass, is allowed to dry in the air; it is then fixed in 99 per cent. alcohol. After this a basic dye, such as methyl-blue or hæmatoxylin, is used, either alone or in combination with an acid counter-stain. In the latter case an eosin hæmatoxylin or an eosin methyl-blue solution is used.

The affected red cells appear in these specimens full of very fine dark-blue points; these granules are found not only in the normal cells, the so-called normocytes, but also in the megalocytes, microcytes and poikilocytes, and they occur not infrequently in the nucleated red corpuscles. As a result of my clinical observations I have called this alteration "granular degeneration" of the red corpuscles, as it is recognized only in those morbid processes in which, with further knowledge of the cases, a degeneration of the blood-cells may be assumed to be present. In the few cases which have grown worse this change in the cells has increased; with improvement it grows less, and when a case is cured it wholly disappears.

This granular degeneration of the red cells is not to be confounded with the products of the dissolution of the nucleus, which are occasionally observed in nucleated red corpuscles in the circulation, as, for instance, in karyolysis, when the residue of the nucleus appears plainly to be recognized as tiny, coarse, round particles in the blood-corpuscles. But the morphological finding alone, with one examination, permits the differentiation of the two processes with certainty, for karyolysis of the red blood-corpuscle, which is often to be seen in bone-marrow, appears to be extraordinarily rare in blood-cells in circulation, and when seen occurs only in high-grade anæmic conditions; while, on the contrary, in severe anæmia, granular degeneration is wanting in the erythrocytes of the bone-marrow, and occurs only in the circulating blood-cells.

From my experience, so far, I believe that granular degeneration takes place in the red cells of the circulating blood, through the influence of different blood poisons. In this way a peculiar reaction of the cell protoplasm is produced. This can be brought about by differ-

ent causes, and it follows from this that the occurrence of this sign of degeneration in the blood is of no simple significance. It admits of but one general conclusion: that it is the result of the action of deleterious substances upon the blood.

In the following cases I shall consider the most important processes in which granular degeneration plays an important rôle; but we must not forget that further experiments in clinical hæmatology may bring to light other more interesting particulars:

1. In chronic lead-poisoning the degenerated red cells occur in the blood in great numbers, and quite uniformly. In more than thirty cases of saturnism we have regularly found these granule cells, each time in direct proportion to the gravity of the disease. In no illness, so far as I can yet judge, do these granule cells play so great a diagnostic and prognostic rôle as in lead-poisoning.

The striking pallor of those affected with lead-poisoning has for a long time been very well known, yet the most thorough examination of the blood, the determination of its specific gravity, its dried residue, the number of blood-corpuscles, and their morphological changes, permit the recognition of no abnormality; so that up to a short time ago I had myself been of the opinion that the anæmia of the lead-worker was only apparent, the deception being brought about by the contraction of the bloodvessels of the body through the influence of the lead upon their muscular walls.

Since our recent experiments this view is no longer tenable, for the presence of great numbers of granule cells in these patients shows that the lead exercises a direct deleterious influence upon the blood-cells, acting, therefore, as a true anæmia producer.

My assistant, Dr. Hamel,¹ has published the detailed results of our research on this subject. Of these results I would mention here, that often the granule cells are seen in the blood of those affected with lead-poisoning, even when no other morphological changes can be found in the blood, and, what is of still greater importance, when absolutely no other symptom of lead-poisoning is noticeable in the patient. Thus we found scattered granule cells in the blood in several painters who were under treatment for some other illness, and who showed no other sign of saturnism, a proof that the lead alters the blood even so early, and an indication to those affected that they should withdraw even further from the possibility of absorbing lead in their work.

Taking into consideration the numerous possibilities of contracting lead-poisoning in daily life, it seems certain that the examination of the blood will be of real use in the future in many doubtful cases of obscure intoxication in investigating the existence of lead-poisoning when it is scarcely suspected.

¹ Deutsches Archiv f. klin. Med., 1900, No. 67, p. 357.

But a negative condition of the blood can also be of great diagnostic significance. Thus, a few weeks ago, a painter entered the Charlottenburg Hospital with complaints of abdominal pains, colicky in character. A distinct blue line on the gums pointed to the main illness, yet the patient declared that for the past six weeks he had no longer used paint containing lead. The blood examination for granule cells gave an absolutely negative result, and upon more detailed examination it became evident that it was not lead colic, but dilatation of the stomach, due to motor insufficiency, which had caused the colicky pains. Thus, in this case, also, the blood examination led to the correct diagnosis. From our present knowledge it seems that, especially in a state of coma, the finding of numerous granule cells will be a valuable support to a diagnosis of saturnine encephalopathy against anæmia and like conditions.

From four to six weeks after treatment has been begun the granules usually disappear from the blood in saturnism. Here, therefore, we have a sure objective point of support for the success of therapeutic measures.

2. In malarial cases granular degeneration occurs frequently. In the first place, A. Plehn,¹ in Kamerun, found basophile granules in the blood-cells of Europeans shortly after their arrival in the tropics. These persons, without any manifest infection with malaria, dysentery, or other infective process, became anæmic to a striking degree and showed a marked decrease in the quantity of hæmoglobin in their blood. Plehn found, for the most part, rather plumper granules than our patients with lead poisoning showed (about 8 to 10 in single red corpuscles). Plehn was of the opinion that they were due to the breaking up of the corpuscles by the malarial parasites, which, to be sure, had as yet caused no outspoken fever or other symptoms, but could still have destroyed the red corpuscles and have made the persons affected anæmic.

Without entering upon a discussion, from which, even provisionally, one cannot decide whether these granules found by Plehn really have any connection with the malarial parasites, I only want to state as certain that in malarial blood, in patients from southern climates as well as from our temperate zone, granular degeneration frequently occurs. From this we must conclude that in malaria, beside the destructive action of the parasites themselves upon the blood-corpuscles, deleterious substances which can injure the plasma of the red cells must circulate in the blood. Plehn himself has also shown the occurrence of granular degenerated cells in the blood of these patients.

3. In close relation with these conditions in the blood of malarial

¹ Deutsche med. Wochenschrift, 1899, Nos. 28-30.

patients stand observations which I have made from experiments relating to the occurrence of these granules following the continued influence of high temperature. From Plehn's observations we know that in Europeans shortly after arrival in the tropics basophile granules appear with striking frequency in the red blood-corpuscles. Now, since it seems certain that at least some of these granules have nothing to do with the malaria parasites, but are only a result of degeneration in the protoplasm of the cells, the question arises whether these changes are not a result of the high atmospheric temperature, which may, perhaps, have an injurious influence upon the organism of the Europeans who come from a temperate zone.

Without being able to decide this important question definitely, I should like to mention the following experiments upon animals, which speak for the possibility of direct injury to the red blood-corpuscles by high atmospheric temperature.

In my laboratory we kept white mice in well ventilated boxes at a temperature over 35° C., and fed them often ample amounts of moist food (such as rolls soaked in milk), so that they got enough fluids. With a temperature of from 37° to 40° C. we succeeded in keeping some of the animals alive for months in their boxes. Later, after they had become accustomed to the heat, they stood temperatures up to 43° C. In some of these animals after almost eight days' sojourn in the boxes there occurred a change in the general appearance: the skin seemed moist, the hair became rough and fell out, especially when touched, and the animals were not so lively as before. The blood at this stage proved to be distinctly diluted, and microscopically large numbers of granular degenerated red blood-cells were found. These had not previously existed in a single animal.

It was, indeed, interesting that later the animals still lived in and apparently grew accustomed to the increased temperature, so that they regained their normal appearance and their earlier liveliness. In accord with this the granules had disappeared from the blood, and some of the animals, as mentioned, remained alive for months in the boxes.

From these experiments we concluded that degenerative changes occur in the red corpuscles of animals under the simple influence of heightened temperature and in the absence of every other harmful element, and these shortly lead to a distinctly anæmic condition of the blood-stream. These laboratory experiments naturally do not permit of our deciding, without further knowledge, concerning the behavior of human blood in hot climates; still it seems important to direct the attention of physicians in the tropics to these blood conditions.

I consider it quite possible that many an insidious anæmia which attacks Europeans in the tropics is not to be referred to infection with parasites in the blood or in the intestines, but is due simply to the in-

fluence of the climate; and I think it exceptionally desirable that physicians in the tropics should turn their attention to these conditions. Perhaps the question which is thought by many to be simply one of the action of parasites is in fact really a true question of climate.

4. Granular degeneration of the red blood-corpuscles is found, in especially great degree, in that severe form of anæmia called "progressive pernicious" or "Biermer's anæmia." The majority of these cases, so far as our observations go, depend upon disturbances in the digestion and assimilation of food-stuffs, whence follow changes of the glandular apparatus of the stomach. Cancer of the digestive tract and auto-intoxication from the intestines undoubtedly play the most important rôle in this. Thus we must accept the view that these absorbed poisons cause the degeneration of the red cells, an admission which agrees well with what we know from other observations upon the origin of these severe anæmias.¹ In these cases we find granular degeneration with other marked changes in the red cells—poikilocytosis, polychromatophilia, etc.; it disappears in these cases, too, when one succeeds by judicious treatment in bringing about the patient's improvement or recovery, and it forms a worthy means of aid in the objective estimation of the amelioration or deterioration of the general condition. In one case under our observation the granule cells, after having been present in the beginning in exceptionally great numbers, disappeared from the blood in two weeks when the severely anæmic condition began to improve; while, at the same time, the specific gravity of the blood increased from 1031 to 1042, and the body-weight from 55 to 61 kilogrammes.

As in pernicious anæmia, the granule cells are found in leukæmia and Hodgkin's disease in later stages, that is, after true anæmic changes occur in the blood; while, on the other hand, they are noticeably absent in chlorosis as long as it is uncomplicated by marked intestinal disturbances, such as obstipation and auto-intoxication.

This lack of degenerative changes in the blood-cells in chlorosis confirms the opinion often expressed by me,² that chlorosis does not depend upon a disease of the blood itself or of the bone-marrow, but is to be considered a neurosis, which occurs about the age of puberty, especially in the female sex, and leads to an accumulation of plasma in the blood and of fluid in the tissues of the organs; following this the red blood-cells swell from the increased plasma eruption, and become pale and poor in hæmoglobin.

Only when complications, especially obstipation, with symptoms of intestinal auto-intoxication, arise in the course of chlorosis are the degenerative changes in the erythrocytes found in this disease.

¹ Grawitz. Progressive Pernicious Anæmia. International Clinics, 1900, p. 72.

² Grawitz. Festschrift der Medizin und Therapie der Gegenwart, vol. vi., 1900.

5. In carcinoma granular erythrocytes are especially numerous, when the position and nature of the tumors are such that the poisonous products of the cancerous process can easily be absorbed. Thus they are very frequent in cancer of the stomach and intestines, but may, on the other hand, be absent in cancer of the uterus, even in advanced stages.

Here, also, under certain circumstances, the presence of these granules in the blood-corpuscles may support the diagnosis, yet a negative finding, without further knowledge, does not speak against cancer of the uterus, as the red blood-disks are not altered by the deleterious matter from carcinoma in all people in the same way. The granules usually appear in very great numbers in those cases of cancer in which the blood shows other grave changes, as poikilocytosis; and we must admit, in those not infrequent cases where, beside a general cachexia, the anæmic changes are so very well developed that they can sometimes almost counterfeit the picture of Biermer's pernicious anæmia, that the cancer-poisoning has an overpowering influence upon the blood; also, the blood-cells of such people are often strikingly incapable of resistance.

6. Finally, the septic diseases must be mentioned. In these the granules are often found in the blood in great quantities. I have often referred¹ to the fact that in sepsis severe anæmic conditions often develop with especially great rapidity; hence, the presence and agency of an intense blood poison must be admitted in just these diseases. The finding of granular erythrocytes confirms this opinion wholly.

No less important than the positive finding of degenerative changes in the erythrocytes are also negative results, when constantly observed, as they admit the conclusion that in such morbid processes no direct blood poison is produced.

Of those diseases which are oftenest associated with a distinct anæmia next to chlorosis, which has been mentioned above, I would next call attention to tuberculosis of the lungs, in which, even in advanced stages, the degenerative changes in the red cells are absent as long as no suppurating cavities, with hectic fever, have produced that cachectic state which must be due, not to tuberculosis as such, but to pus infection. In tuberculosis, also, the absence of degenerative changes in the blood confirms the views which I had derived from certain earlier experiments. From these investigations I concluded that the extreme pallor of tubercular patients does not depend upon the total destruction of the red blood-cells, but upon the involvement of the blood in the general tissue atrophy, so that a condition of true oligæmia, that is, a reduction of the general amount of blood, develops; following this, the vessels of the skin are insufficiently supplied, and general pallor and anæmia are the results.

¹ Grawitz. *Klinische Pathologie des Blutes*, 1896.

It is, next, worthy of notice that the granules are not found in syphilis, either in the primary or later stages ; and that, in saturation with mercury, also, nothing of the sort is seen in the blood. So, too, the granules are absent in chronic nephritis, chronic liver disease, diabetes, the acute infectious diseases, typhoid fever, and diphtheria.

From the above observations I have come to consider the finding of granular erythrocytes of importance when they occur in certain pathological conditions with some constancy, and also when they are regularly absolutely wanting. Their presence or absence permits us to decide upon the etiology of many anæmic conditions, that is, makes it possible for us, taking into consideration the other results of experimentation, to determine whether, in this or in that disease, a true blood poison exists, or whether the anæmia is to be taken as but one symptom of a general cachexia. The granules are naturally to be considered only as a symptom which occurs under several conditions, and which does not permit, therefore, of but one conclusion. On the contrary, like other symptoms, it is of value only when considered together with the other signs of disease. The occurrence of a few scattered granular erythrocytes is without significance. The diagnosis can be aided, in many doubtful cases of anæmia, by the finding of granule cells, or by their absence. Especially is this the case in certain instances of saturnism which are hard to recognize ; also, too, in those cases in which there is a question whether the existing anæmia is to be referred to a malignant neoplasm or to chronic nephritis or similar diseases. The relation of the granules to the etiology of so-called tropical anæmia I have already demonstrated above. In many cases granular degeneration appears in the blood as the first distinct sign of anæmia, even before other morphological changes are recognizable ; so that it is, in such cases, especially important as an early symptom of anæmia. In some cases it occurs, indeed, as the only morphological change.

IDIOPATHIC DILATATION OF THE ŒSOPHAGUS.

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By the term "idiopathic dilatation of the œsophagus" those conditions are meant in which there is a dilatation of the œsophagus without any mechanical obstacle within or outside of the œsophageal walls or cardia.

Idiopathic dilatation of the œsophagus has been known to the medical profession since the beginning of the nineteenth century. Thus Purton¹ reports a case of this disease in 1821 ; he gives a minute and

characteristic description of the affection under consideration, and the following may be cited from his article :

“ Patient, forty-three years old, when a youth, received a severe blow on the sternum, which deprived him for some minutes of sense and motion ; ever since which time he has labored under more or less difficulty in swallowing. Throughout the last twenty years, during which time I have occasionally attended him, he has suffered at intervals many very severe attacks, continuing sometimes for three weeks or more ; during the whole of this time scarcely any food entered the stomach. Occasionally, however, he was able, for months together, to propel, after violent exertions, the contents of the sac into the stomach. If the food was not propelled into the stomach by a certain degree of force he would reject it ; so that latterly he never attempted to use any violent efforts, but would suffer it to remain in the sac for hours, and even days ; and probably it was in part digested, as the internal surface of the sac presented, in a slight degree, the rugose appearance of the stomach. . . . No kind of food passed through the contracted cardia until the sac above it was quite distended ; nor did he until then attempt to use any voluntary exertion, as experience had taught him that previous efforts were ineffectual.

“ On dissection the Œsophagus was found greatly distended, forming a sac or pouch reaching from within two inches of the pharynx to the cardia ; it contained by admeasurement full two quarts. The cardiac orifice was found pervious, but much contracted ; no particular appearance of disease was remarked in any other viscus.”

A few years later, in 1833, Hannay², published another case of dilatation of the Œsophagus, causing dysphagia. In his patient the difficulty of swallowing had existed since boyhood, at which time the patient had received a violent blow on the chest, inflicted by a club or shinty. Hannay expressly remarks that “ no obstruction was experienced on passing a probang.” At the autopsy the Œsophagus was found enormously dilated, and the parietes of the tube were several times their ordinary thickness. There was no obstruction either by tumor, external to the tube, or by constriction within the canal.

In these two cases of Purton and Hannay the diagnosis of dilatation of the Œsophagus, although surmised during life, had not been made until the autopsy ; it is only within the last twenty years that this disease was definitely recognized during life. Zenker,³ Strümpell,⁴ Mermod,⁵ Meltzer,⁶ and myself⁷ were among the first to describe such cases during life, and also to advance the diagnostic features of this disease. Mermod's article, appearing in 1887, contains the first clinically well described, thoroughly examined case of idiopathic dilatation of the Œsophagus. He recognized the intimate connection existing between the cough found in these cases and the dilatation of the Œsophagus. He says :

“ The general state seems to grow better, but the vomiting and the night cough continue ; the latter is uselessly fought with by the ordi-

nary measures, and the physician in attendance appears to have had an uneasiness with regard to the chest."

He also observed the important fact that a tube introduced into the stomach of such a patient may find this organ empty, while there is food above the stomach (in the Œsophagus), not appearing through it, unless the latter be partly withdrawn in such a manner that the end of the tube lies within the Œsophagus. He says :

" While a flexible tube introduced without the least difficulty into the stomach brings up nothing, or merely pure water which has just been ingested, the patient vomits food substances, which appear in large quantity around the tube. I withdraw the latter for 10 or 15 centimetres and now the same food substances appear through it."

The existence of two cavities above one another, the Œsophagus being the one and the stomach being the other, in which fluids may accumulate without mixing with each other, Mermod ingeniously showed by the separate ingestion of two differently colored fluids into the cavities. He describes this experiment in the following words :

" I carefully clean the upper pouch until the water returns perfectly clear ; then I pour in about 220 grammes of lukewarm water, slightly stained red by means of cochineal. The tube which is withdrawn from the mouth, and a few minutes later again inserted into the Œsophagus, brings up a red liquid, which corresponds to the entire quantity ingested. I now put the tube 15 centimetres further down into the stomach, which has not received one drop of the coloring matter, for the water which I now pour in returns unstained."

He concludes his article with the following words :

" Thus we have here a purely functional spasmodic contraction and not a permanent organic stricture, for a bougie of ivory of 13 millimetres' thickness encounters but a very slight resistance, which quickly disappears for the further introduction of the bougie, and which is often met with in every other Œsophagus."

To Meltzer is certainly due the credit of having described a case of dysphagia clinically among the first observers, and to have given an explanation for this condition in the spasmodic contraction of the cardia.

Strümpell as well as Meltzer made use for the diagnosis of this condition of the different qualities existing in the vomited matter (in the one case coming from the Œsophagus, in the other from the stomach), the former being neutral in reaction, while the latter shows the existence of an acid, mostly hydrochloric acid. In my own case, described in 1888, I could confirm the last two observers and add the so-called " coffee experiment," which consists in having the patient drink a cupful of black coffee one hour before the examination. The patient is instructed to try and force the coffee down by taking deep inspirations and compress-

ing his thorax, thus mechanically forcing the fluid from the Œsophagus into the stomach. An hour later the patient drinks a glassful of water. The tube is now inserted into the Œsophagus, the water appears quite clear, and is regained in almost the same amount as taken by the patient. Thereupon the tube is pushed in a little further into the stomach, and now some coffee will appear without the admixture of water. This experiment shows that the water has remained above the stomach in the Œsophagus, not mixing with the coffee. Apart from the different color in these two fluids it is self-understood that the water obtained from the Œsophagus will show a neutral reaction, while the coffee, gained from the stomach, will show the characteristics of gastric juice, presence of hydrochloric acids, and ferments. This coffee experiment is based upon the same principles as Mermod's color solutions, and serves the same purpose. When I described my first case of dilatation of the Œsophagus and mentioned the coffee experiment I did not know of Mermod's case, and thus the credit for this diagnostic means belongs to him.

During the last ten years a great number of well-observed cases of dilatation of the Œsophagus appeared. Thus Kreuder,⁸ Leichtenstern,⁹ Hoelder,¹⁰ Maybaum,¹¹ Fleiner,¹² Jaffé,¹³ Rumpel,¹⁴ Wiebrecht,¹⁵ Ewald,¹⁶ Boas,¹⁷ Reitzenstein,¹⁸ Netter,¹⁹ Westphalen,²⁰ Rose,²¹ and Jung²² have written extensive papers on this subject. Mintz²³ and Reitzenstein were the first to describe the occurrence of diverticles of the Œsophagus in its lower portion.

Rumpel has described two typical cases of spindle-shaped dilatation of the Œsophagus with autopsy. To Rumpel credit is given for having first examined the Œsophagus by means of X-rays after the ingestion of a 5 per cent. subnitrate of bismuth mixture; the enlarged Œsophagus could then be recognized by its shade on the breast. He also suggested the following ingenious method of examination in order to differentiate between a low-sitting diverticle and a dilatation of the Œsophagus: A thick tube, provided with numerous openings along its lower portion (for about 15 cm.), is introduced into the stomach in such a manner that some of the openings are still in the Œsophagus. Another tube of thinner calibre, to which a funnel arrangement is attached, is then introduced into the Œsophagus. A certain measured quantity of water is now poured through the funnel into the Œsophagus, and the funnel lowered in order to siphon out the fluid; now, if we have to deal with a dilated Œsophagus the water poured into the organ will run through the openings of the tube, above the cardia, into the stomach, and thus the Œsophagus being empty nothing will return through the lowered funnel of the Œsophageal tube. If, however, a diverticle is present the water, poured in through the thinner tube, will remain there, and thus most of it will return on siphonage.

Transillumination of the œsophagus has also been tried for diagnostic purposes, first by Mintz and later on by Rumpel and others. In some pronounced cases of dilatation of the œsophagus transillumination can be obtained.

A few years after the publication of my first case of dilatation of the œsophagus I²⁴ had an opportunity to observe another instance of the affection, with the only difference that in the new case there was encountered first a stricture of the cardia, which, however, quickly yielded to dilatation by bougies; the dilatation of the œsophagus, however, remained unaltered. A description of this case may be found in the *Post-Graduate*.

At the meeting of the German Medical Society, May 7, 1900, K. Dauber²⁵ read an exhaustive paper upon this subject, and described four cases of his own of spasmodic contraction of the cardia with dilatation of the œsophagus.

Within the last five years I had the opportunity of meeting with a considerable number of cases of idiopathic dilatation of the œsophagus. In so far as this affection appears to be quite rare—in the entire literature only about forty-five cases being mentioned—I deem it of interest to report a few of my cases in full, and to treat the rest in a more condensed form. In conjunction with this I shall endeavor to describe the symptomatology, diagnosis, and treatment of this affection, based principally upon my own experience.

CASE I.—Mrs. K. C., aged about forty-five years, has been complaining for the last two years of difficulty in eating. While at first she would only occasionally notice that she would have to stop in the middle of the meal, on account of a feeling of oppression within her chest, recently there is hardly a meal that she can enjoy without trouble. She noticed that she must eat and drink very slowly, as otherwise the feeling of oppression would come sooner. During the meal she is obliged to make several intermissions, at which she takes a few mouthfuls of water and tries to get the food down. Solid particles of food seem to cause somewhat more difficulty than liquid and semiliquid foods, although the latter alone also cause distress. Occasionally, especially if the patient has taken a meal without caution, she is obliged to vomit, in which event the food returns quite unchanged. During the night she occasionally awakens with a feeling of constriction in her chest and a constant irritation in her throat, necessitating incessant coughing for quite a while. Often these coughing spells are followed by vomiting, in which event there is at once a decided sensation of relief. Patient has lost considerably in weight, about thirty-five pounds.

On examination the chest organs, as well as the abdominal viscera, were found normal. Patient looked somewhat pale and anæmic. She was then told to drink some water; no swallowing sound could be discovered on auscultation at the ensiform process. A tube introduced into the œsophagus, at a length of 33 cm., brought up some water and undigested particles of food, giving a neutral reaction. The tube was

then slowly pushed a little further in, down to a distance of 40 cm. from the teeth. When the contents stopped flowing the tube was pushed still further, without encountering any resistance, into the stomach. Now, again, some contents were expelled through the tube. The analysis of these, the gastric contents, showed a faint acid reaction, absence of hydrochloric acid and of ferments, the particles of food being very little changed, if at all.

On the following morning the patient, in the fasting condition, took a cupful of black coffee, and for a few minutes tried to force the coffee into the stomach by compressing the thorax after deep inspirations. Three-quarters of an hour later, when in my office, she took 250 c.cm. of water, and while drinking I failed to hear any swallowing sound. Five minutes after the ingestion of the water I introduced a tube into the Œsophagus (length, 35 cm.); the entire amount of water returned without any admixture of coffee. The tube was then pushed further down into the stomach, and now by the expression method about 60 c.cm. of a coffee-colored fluid were obtained, giving the characteristic coffee odor. Here, also, hydrochloric acid and ferments were missing.

The patient was put on a diet consisting principally of milk, eggs, cereals, butter, and very little meat. She was told to eat four times daily and to practice exercises for forcing the food down after each meal. Each night before retiring she was instructed to introduce a tube into the Œsophagus, empty its contents, and wash it out. This treatment was crowned with good result, in so far as the general condition of the patient improved, the coughing stopped, and she gained in weight, but the difficulty in eating or the dysphagia remained.

CASE II.—*August 25, 1899.* Francis P. R., aged twenty-eight years, merchant, began to be troubled with "pains in the abdomen" about three years ago. Hot water would make him vomit, and he would feel better. Soon afterward he noticed that he could not eat. Everything he took seemed to burn his gullet, and would not go down. He began to regurgitate the food and to lose in flesh. During a period of constipation the symptoms were worse. Patient is compelled frequently to get up from the table before finishing his meal, having a suffocating feeling, connected with fright. After several coughing spells a small portion of food would be regurgitated, after which he would feel better. Occasionally hasty gulping down of water prevented such an attack. At night, in the recumbent position, the patient is often disturbed by coughing spells. Occasionally food is regurgitated during sleep, and the patient, when awakened, finds the pillow soiled. Patient has lost thirty pounds in weight.

The physical examination of the chest and abdominal organs does not reveal anything abnormal; the swallowing sound is found absent; a thick bougie passes the cardia without resistance. A tube introduced into the Œsophagus brings up 100 c.cm. of undigested food, surrounded by mucus.

26th. Fasting condition. The Œsophagus is found to contain food; a thick bougie passes the cardia without any resistance. The patient drinks a cupful of black coffee and uses exercises serving the purpose of compressing the chest. Thirty-five minutes later he drinks about 250 c.cm. of water; no swallowing sound can be heard. Three minutes later a tube (38 to 40 cm.) is introduced into the Œsophagus; the water and a few pieces of roll are voided, but no trace of coffee can be dis-

covered. The reaction of the fluids is slightly acid; there is no free hydrochloric acid present, and no ferments. Then the tube was introduced further down into the stomach; this time, however, a slight resistance was encountered at the cardia, but was easily overcome. By the expression method a fluid of distinct coffee-brown color is obtained, giving the following reactions: HCl absent, strongly acid, rennet and pepsin ferment present.

The treatment consisted in œsophageal lavage before retiring, a mixed diet rich in milk, cereals and butter, and regular exercises for forcing down the food from the œsophagus into the stomach. Patient gained twenty pounds in a period of six months, felt stronger and better in every respect, but his dysphagia remained unaltered.

CASE III.—*September 17, 1898.* Margerie S., aged fourteen years, has been troubled for the last two years with attacks of suffocation, appearing in the middle of the meal. She is often obliged to regurgitate the food. During the last year she has frequently vomited. In her sleep she is often disturbed by coughing spells.

An examination of the chest and abdomen does not reveal anything abnormal. The swallowing sound is absent. The thick bougie passes the cardia without any resistance. A tube introduced into the œsophagus brings up about 100 c.cm. of milk and pieces of cracker. The milk is not coagulated and shows neutral reaction. The tube is then pushed further down into the stomach, no resistance being encountered at the cardia. By the expression method real gastric contents are now obtained, consisting of coagulated milk and finely divided particles of cracker. In this portion free hydrochloric acid as well as the ferments are present. The treatment was the same as in Case II.

The remaining cases I prefer to give in abstract:

CASE IV.—1896. Miss T., aged forty years, troubled with dysphagia for the last five years. No swallowing sound present. Thick bougie meets with no resistance at the cardia. Œsophagus is found to contain contents of slightly acid reaction, but no free hydrochloric acid or ferments present, while the real gastric contents reveal the presence of free hydrochloric acid.

CASE V.—1897. Mrs. L. S., aged thirty-three years, troubled with dysphagia for the last four years. Swallowing sound absent. Thick bougie passes cardia without resistance. Crackers, taken the night previous, are found in the œsophagus, the reaction being neutral—ferments absent. At the same time gastric contents are obtained, showing the presence of free hydrochloric acid and ferments.

CASE VI.—*August, 1897.* Max G., aged twenty-eight years, troubled for two years with dysphagia and attacks of asphyxia. Swallowing sound absent. The tube meets with slight resistance at the cardia, which is, however, easily overcome. Contents are found in the œsophagus (with neutral reaction, absence of ferments) and also in the stomach, the latter showing the presence of free hydrochloric acid and ferments.

CASE VII.—*June, 1898.* Charles P., aged forty-seven years; feeling of fulness and frequent regurgitations for the last three years; swallowing sound absent; thick bougie encounters no resistance at the cardia. A tube brings up first the œsophageal contents, containing no ferments and showing neutral reaction; and later the real gastric contents, containing free hydrochloric acid and ferments. Transillumination of the

stomach shows the latter organ to be normal. When the lamp is withdrawn and brought into the œsophagus no transillumination area can be seen. Coffee experiment is distinct.

CASE VIII.—*May*, 1899. Mrs. Ida J., aged about thirty years, has been troubled for the last eighteen months with occasional difficulty in swallowing. Sometimes she apparently is able to eat everything, at other times, however, she can hardly take liquids with impunity. During the meal she occasionally has a suffocating spell. She does not complain about coughing; swallowing sound absent. Thick bougie passes cardia without any resistance. Two hours after a meal consisting of crackers, milk, and eggs the examination with the tube revealed the presence of about 100 c.cm. of unchanged food in the œsophagus, this portion giving a neutral reaction and showing no ferments. The tube introduced further into the stomach now brings up another portion of chyme, showing the presence of acid and ferments, but no free hydrochloric acid.

CASE IX.—*October*, 1899. Ludwig S., aged forty years, suffers from dysphagia; considerable coughing during the night; swallowing sound absent; bougie meets with some resistance at the cardia, 39 cm. from the teeth, which is, however, overcome. A thicker number meets with more resistance, but also passes. Two hours after a test-meal the tube introduced into the œsophagus brings up undigested food of a neutral reaction; when the tube is pushed further into the stomach the contents obtained are of a decidedly acid reaction, showing the presence of free hydrochloric acid and ferments.

CASE X.—*June*, 1899. August B., aged thirty-four years, has been troubled with dysphagia for the last four years; swallowing sound absent; a middle-sized bougie meets with some resistance at a distance of fifteen and one-half inches (39 cm.) from the teeth, which is, however, overcome. Yet this result is changeable, for occasionally there is no resistance encountered at all. The examination with a tube two hours after a meal shows the presence of about 120 c.cm. of contents within the œsophagus, consisting of unaltered food of neutral reaction and also of gastric contents of a strongly acid reaction, with the presence of free hydrochloric acid and ferments.

EPICRISIS. In the twelve cases of idiopathic dilatation of the œsophagus observed by me (ten described in this paper and two published previously), there was a distinct etiological moment for the origin of the trouble in two, viz., trauma in one (case published in the *Medical Record*) and a benign stricture in the other (case published in the *Post-Graduate*). In the latter the stricture quickly yielded to dilatation with bougies, but the dilatation of the œsophagus remained. In all the ten cases described in this paper no etiological factor could be discovered to which the trouble could be ascribed.

As already stated in my first paper on this subject, idiopathic dilatation of the œsophagus may be the result of the following three conditions: 1. Paralysis (or atony) of the œsophagus. 2. Spasmodic contraction of the cardia. 3. A lack in the reflex relaxation or opening of the cardia during the act of swallowing.

The latter condition seemed to prevail in my first case. In a few of the cases described in this paper a resistance was encountered at the cardia when a bougie was introduced, but was easily overcome. In these cases the assumption of a spasmodic contraction of the cardia as a prime factor of the disease is plausible. In the remaining cases it is quite difficult to decide to which of the three possibilities enumerated above the condition was due. Rosenheim²⁶ ascribes many cases of idiopathic dilatation of the œsophagus to atony, while Meltzer, Ewald, and Boas plead for a spasmodic contraction of the cardia as the prime trouble. In many of the cases mentioned, in which no resistance whatever was encountered at the cardia at any time, a spasmodic contraction existing at the time of the observation must apparently be excluded. Such a condition, however, may have prevailed originally, having caused the dilatation of the œsophagus, the latter remaining even after the cessation of the spasmodic contraction.

SYMPTOMATOLOGY. Dysphagia, or difficulty in eating—*i. e.*, difficulty in propelling the food down from the mouth to the stomach—is encountered in all cases of dilatation of the œsophagus. In some cases this difficulty in eating is so little pronounced that the patients themselves are hardly aware of the presence of some abnormal condition. They become conscious of some existing trouble if they accidentally swallow a big piece or take a large drink hastily. A feeling of pressure or fulness within the chest is often encountered. The latter occasionally increases to regular attacks of dyspnoea. A sensation of suffocation is also often met with, especially during meals. The patients are frequently troubled with an obstinate cough, which appears principally at night-time in the recumbent position, often disturbing the patient's sleep. Vomiting or regurgitation of the œsophageal contents appears occasionally pretty soon after meals, or at night-time in the recumbent position, accompanying the coughing spells. The difficulty in eating and the fear of the suffocating spells cause the patient to take less nourishment than required, and consequently there is usually a considerable loss of flesh observed. The appetite, as such, is generally not impaired. The bowels are mostly regular, but rarely constipated.

OBJECTIVE SYMPTOMS. The swallowing sound of Meltzer is absent. I consider this as a very important point. In none of my cases could either the first or the second swallowing sound be heard at the ensiform process. A few of the writers state that in some of their cases of dilatation of the œsophagus the first swallowing sound was present. Thus Westphalen mentions that in his case the first swallowing sound was present and different in character from the normal sound, for it was produced as if liquid splashed into a cavity containing another fluid. Westphalen considers this quality of the sound as characteristic of a

dilated œsophagus. I have, however, encountered a very similar "first swallowing sound" in a patient who had no dilatation of the œsophagus.

Examination with the tube shows that when the latter is introduced at a length of about 30 to 35 cm. into the œsophagus contents appear through the tube as well as sometimes also outside of it, being undigested, of a neutral or slightly acid reaction, and containing no pepsin or rennet ferments. When the same tube is pushed further down into the stomach real gastric contents can be obtained, showing the presence of hydrochloric acid and ferments. Examination with a silk-worm bougie is often of importance, especially in cases in which a resistance of the cardia is encountered; the latter bougie, being less flexible, will not turn over itself, and will enable us to judge more accurately of the distance from the teeth to the cardia and also whether the latter orifice has been penetrated.

The coffee experiment, described above, will serve to show positively the existence of two cavities in which fluids collect without mixing with each other.

DIAGNOSIS. Idiopathic dilatation of the œsophagus will be diagnosed when dysphagia of long standing exists, the swallowing sound is found absent, no organic stricture encountered, and the œsophagus found partly filled with unaltered food.

The differential diagnosis must exclude malignant growths, a low sitting diverticle of the œsophagus, and an antrum cardiæ.

A malignant growth which has not led to a stricture is never accompanied by dilatation of the œsophagus; moreover, the swallowing sound will be found present. The general signs of malignant disease will also be discovered.

A low-sitting diverticle occurs but very rarely. Its existence may be excluded if the bougie or tube always enters the stomach without much difficulty. Rumpel has suggested the examination with two tubes as mentioned above, in order to differentiate between diverticle and dilated œsophagus. It appears to me that Rumpel's method should be applied only in those cases in which the tube often fails to enter the stomach; otherwise we can be pretty sure that we have to deal with dilatation of the œsophagus and not with a diverticle.

An antrum cardiæ, which occasionally occurs, is but a very small sacculation, containing only at the utmost 50 c.cm. The latter will therefore be excluded if we find that the cavity above the stomach is able to hold 200 or more c.cm. Transillumination, œsophagoscopy, and X-ray examinations of the œsophagus have also been used for diagnostic purposes in this affection.

PROGNOSIS. The prognosis is good *quo ad vitam*, but bad as regards complete recovery. All of my cases improved considerably very

quickly; the patients were all able to attend to their daily vocations and to enjoy almost perfect health, with the single exception that the dysphagia continued.

TREATMENT. *The diet* should consist of liquid, semiliquid, and solid foods rich in nutritious material. After each meal the patient must be instructed to perform exercises, consisting in compression of his chest after deep inspirations for a few minutes; this serves to force the food down from the œsophagus into the stomach.

Lavage of the Œsophagus. Every evening before retiring the œsophagus should be emptied and washed out by means of a tube.

The application of the faradic and also of the galvanic current within the œsophagus has been recommended by Rosenheim and others. I had the opportunity to make use of the faradic as well as of the galvanic current in one of my patients, but without the slightest benefit whatever. Feeding through a stomach-tube has been tried without permanent relief.

A sufficient diet, the exercises for forcing the food down, and lavage of the œsophagus are the essential points. Bromides, iron, and arsenic may also be of occasional benefit.

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MYOSITIS OSSIFICANS.

WITH A REPORT OF TWO CASES.¹

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THE comparative rarity of myositis ossificans, its peculiar clinical and anatomical manifestations, and, more than all, the mystery enshrouding its etiology, make the disease one of great interest to the pathologist, the clinician, and the surgeon; and the report of two similar cases, while it may add little to the existent knowledge on the subject and do little to enlighten us as to the etiology of the disease, cannot fail to be of value. As Roth says: "If we no longer, in the present state of our knowledge, consider myositis ossificans as a pathological curiosity, yet, in view of the still small number of published cases and the darkness which still hovers over the whole character of the affection, the demonstration of a patient suffering from this mysterious disease must be interesting."

The autopsies in my cases were made by Dr. Warthin, and it is to his kindness that I am indebted for the post-mortem notes, the material, and many valuable suggestions.

The first of the cases is of a young farmer, aged twenty-three years, the cause of whose death was pulmonary and laryngeal tuberculosis. He died April 11, 1897. His clinical history presents nothing of interest in this connection until March 1, 1897, when he complained of pain in the left leg. On examination the left leg and foot were found swollen, soft, and oedematous. The thigh was also swollen, though less than the leg. On March 28, 1897, examination showed the left leg only slightly oedematous, and it was no longer painful. A marasmic

¹ Read before the Washtenaw County Medical Society, March 5, 1900.

thrombus of the left saphenous vein was believed to have caused the oedema.

The autopsy showed a very general tuberculous process. Both lungs were infiltrated with tubercles and contained large cavities. Small tubercles were found in the spleen, liver, adrenals, and kidneys, and a tuberculous ulcer in the lower part of the ileum. The bronchial glands contained many areas of caseation, the mesenteric glands were enlarged and some of them caseated, and all the lymph glands of the body were enlarged.

In the left saphenous vein was found an old, partially organized thrombus, extending downward for a distance of about ten inches. This extended upward into the femoral vein, which was partially closed by a mixed thrombus, apparently fresh. From the femoral vein the partially obturating thrombus extended into the left external iliac, and through this in constantly decreasing size into the left common iliac and the abdominal vena cava. Around the wall of the femoral vein there was an area of hyperæmia and infiltration, extending apparently from an enlarged lymph gland near by. This gland on section showed infiltration and beginning caseation.

The femoral vessels with the thrombus and the circumjacent fat, connective tissue, and muscle were removed, hardened in Müller's fluid, dehydrated, embedded in celloidin, and sectioned. The sections were then stained in hæmatoxylin and eosin. Some of the sections were counterstained in Van Gieson's picric acid and acid-fuchsin mixture, and others were stained by Unna's orcein method for yellow elastic tissue.

The microscopical appearance is as follows: Both femoral vessels are nearly or quite filled by thrombi in various stages of organization.

The whole section shows marked hyperæmia, all the smaller vessels and even the capillaries being distended and packed full of blood corpuscles. The connective tissue surrounding the large vessels, as well as that around the smaller ones, is infiltrated with leucocytes. Especially around the distended capillaries are seen aggregations of small round cells. This leucocytic infiltration is especially marked in the intermuscular connective tissue and around the capillaries found in that connective tissue. Many of the leucocytes are markedly degenerated, and in some parts of the sections larger or smaller necrotic, abscess-like areas are found. Surrounding these necrotic areas, and indeed in many parts of all the sections, attempts at repair are noticeable. The inflammatory tissue seems to have been replaced by a new granulation tissue, rich in small, thin-walled bloodvessels and in large plate-like cells, with little fibrous tissue.

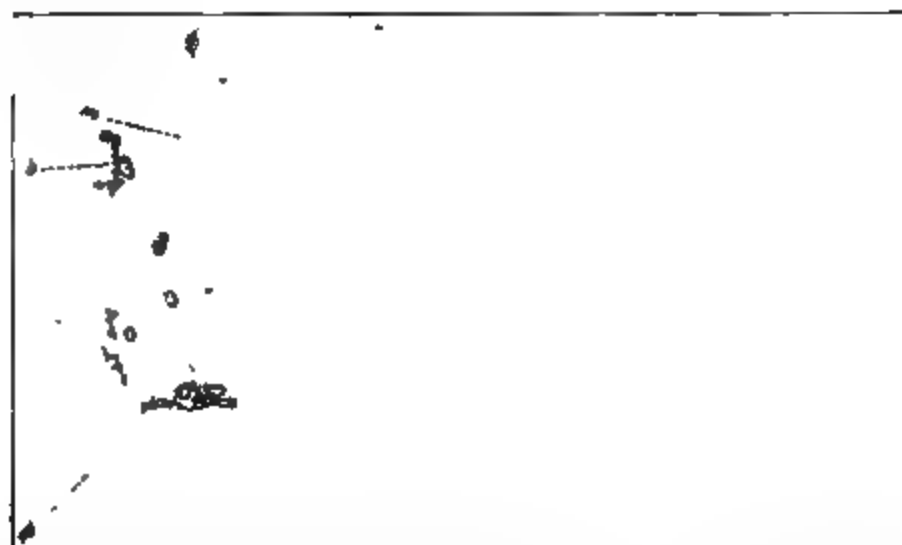
The most marked changes to be noted are, however, in the muscular tissue. As before stated, the intermuscular connective tissue is hyper-

æmic and infiltrated with leucocytes. In some parts of the sections, especially at the periphery, the muscle appears fairly normal, but even here, in most of the fibres, the cross striation has disappeared or is less distinct than in normal muscle. The longitudinally cut muscle fibres, which are of normal size near the periphery, become smaller as they near the centre, and may taper to a point or divide into several muscle fibres or seem to resolve themselves into numerous bundles of fibrous tissue. Nearer the centre of the section the muscle fibres are all much smaller than normal, of very irregular contour, with no cross striations, and in some even the longitudinal striation seems lost, the fibres appearing either finely granular or quite homogeneous. In some places a muscle nucleus with a small spindle-shaped bit of protoplasm is separated off from the rest of the cell. The nuclei may be absent from a considerable part of the fibre and crowded together at one end or at one side, and often a small, narrow fragment of muscle containing many nuclei is seen. Some of the longitudinally cut muscle fibres, after decreasing in size, suddenly enlarge, club-like, at the extremity, this enlargement containing large numbers of muscle nuclei. Often small, isolated fragments of muscle are seen in the granulation tissue, and even in and near the inflammatory, necrotic areas, containing numerous nuclei, embedded in homogeneous appearing protoplasm, producing the appearance of giant-cells. We find everywhere marked variations in the size and shape of the muscle fibres, with the ends pointed, branched, or club-like. Along the course of the fibre the nuclei are generally greatly increased in number and are scattered irregularly through the apparently undifferentiated sarcoplasm. Beside the simple atrophy, some of the fibres seem to be undergoing fatty degeneration and some Zenker's waxy necrosis.

In the granulation tissue, which seems to have replaced the larger inflammatory areas, we find irregularly branching and anastomosing trabeculæ of osteoid tissue, consisting of a dense matrix, enclosing rather large cells, which are usually not surrounded by a capsule. These trabeculæ surround smaller areas of granulation tissue which is richly supplied with bloodvessels and which here somewhat resembles bone-marrow. Many of the large cells of these spaces are arranged in a more or less continuous layer on the trabeculæ, like the layer of osteoblasts on the trabeculæ of developing bone. Most of the osteoid tissue has undergone calcification, at least in the central part, so that, according to Ziegler's definition, we may believe that we have here a true ossification process. In some of the sections these plates of bone form a nearly continuous ring around the larger bloodvessels. In others they are scattered throughout the section in smaller masses, always found in the new granulation tissue, never in the old connective tissue, nor in the inflammatory tissue which is still undergoing retrograde changes.

These ossified masses are found not only immediately around the femoral vessels, but extending out in all directions between the degen-

FIG. 1.



Section through both thrombosed femoral vessels, muscles, fat, connective tissue and granulation tissue containing plates of bone. m, muscle; b, bone; c, calcification; t, thrombus. Drawn under the dissecting microscope, with aid of camera lucida. Magnified about eight times. Reduced to one-half size of drawing.

FIG. 2.

s

s

b

m

v

b g v

Section through a few trabeculae of pathological bone formation, with marrow spaces, surrounding granulation tissue, and, at the periphery, degenerating muscle fibres. b, bone; m, degenerating muscle; g, granulation tissue; s, marrow spaces; v, capillaries surrounded by connective tissue infiltrated with leucocytes. Drawn with the aid of the camera lucida. No. 2 eye-piece; $\frac{1}{8}$ in. objective. Reduced to one-fourth.

erating and regenerating muscle fibres, wherever a sufficiently large area of granulation tissue is found. The relation of the plates of bone

to the other tissues of the section is represented in Fig. 1. In the marrow spaces we see frequently small bits of degenerated muscle, atrophied, non-nucleated, and appearing homogeneous.

It may not be uninteresting to speak here briefly of the changes in the yellow elastic tissue as brought out by Unna's orcein differential stain. In the necrotic areas, in the degenerating inflammatory masses, the yellow elastic tissue seems to have disappeared or to have lost its power of taking the differential stain. In some parts of the granulation tissue, on the other hand, we begin to see short pieces of fine fibres, which are well stained with the orcein, the surrounding tissue remaining unstained, while in the older parts, at the periphery of the larger bone-containing masses the fibres are coarser and more massed together. Even in the bone tissue itself, fine, yellow elastic fibres are occasionally seen. It seems unquestionable that in this process the yellow elastic tissue, as well as the muscle and fibrous connective tissue, degenerates and regenerates.

The enlarged lymph glands in the neighborhood of this hyperæmic process were removed and examined. No tubercle bacilli were found, nor was the histological structure that of a tubercle, but rather of a simple, necrotic abscess.

The changes in the tissue would seem to indicate that the intermuscular inflammation, the changes in the muscle, and the bone formation antedated by a considerable time the thrombosis, which was probably secondary to the other changes, and was the cause of the clinical symptoms noted about a month before death.

In the second case I have found nothing of interest in the clinical history except the fact that the thigh was broken about five weeks before the man's death.

In this case also there was an obturating thrombus of the femoral vein, and the microscopical appearance is identical with that in Case I. The only difference in the two cases is that in Case I. the process seemed to result from a chronic inflammation (possibly tuberculous), while in Case II. it resulted from an injury to bone, which may have injured also the muscle and other soft parts. It should be stated, however, that the fracture was not near the point of ossification of the muscle.

In both cases we have thrombosis of the femoral vein, which has not occurred in any of the other cases cited in the literature to which I have had access; also periarteritis, periphlebitis, inflammatory infiltration of the intermuscular connective tissue, with degenerative changes in the muscle, and ossification of the granulation tissue.

In both cases, also, the process was not discovered until the autopsy had been made and the sections examined microscopically.

Cases of pathological ossification naturally divide themselves into two great classes: those in which bone is formed in connection with bone,

and apparently resulting from an abnormal activity of the cells of the periosteum, and those in which bone is formed in the softer tissues and has no connection, primarily at least, with the skeletal bones or their periosteum. Of the first class I need say nothing further, as the consideration of these cases is quite foreign to my subject. In the second group of cases, myositis ossificans may be said to occupy a very prominent position. Cahen divides this disease into two classes: a progressive form and a localized or stationary form. The progressive type, known as myositis ossificans progressiva, is, according to Cahen, distinguished from the localized form by the facts that it begins in youth, advances periodically, and attacks many series of muscle groups. To this type belong most of the cases recorded in the literature, which is perhaps due to the easier recognition of this type of the disease.

Roth has recently given an excellent review of much of the literature on this subject, and I may be permitted to draw somewhat freely from his review, especially with regard to those works to which I have not had access. The earliest case reported was in 1740, by Freke, in the *Philosophical Transactions*, the description of the case corresponding very exactly with the descriptions now given. In the same journal, in 1741, Copping thus describes a case: "Das ganze Rückgrat war ein zusammenhängender Knochen, von dem sich ein scharfer Rand erhob, der wie eine Handhabe aussah, woran man das Skelet halten konnte. Es waren ihm jedes Jahr aus den Fersen Hörner gewachsen, wie die Sporen bei den Hähnen und die Ueberwüchse von Knochen waren in so grosser Menge da, dass es eben so schwer sein würde, sie zu zählen als die Stalactiten in der Grotto der Calypso." Other cases were noted by Henry (1759), Rogers (1832), Testelin and Danpressi (1844), Hawkins, Wilkinson, and Abernethy.

In 1869 Münchmeyer, giving to the disease the name suggested by v. Dusch, myositis ossificans progressiva, described it so exactly that later writers have been able to add little to his description. He declared the disease to be a constitutional affection of slow course, with periodical exacerbations. The first disturbance in muscular tissue begins with a marked infiltration of the intermuscular connective tissue. The second state—that of connective tissue induration—consists of an excessive growth of intermuscular connective tissue with destruction of fibrillar muscle substance in consequence of pressure atrophy or fatty degeneration. The third state is that of ossification, which begins in the centre of the affected muscle, in the connective tissue ground substance. The disease begins in youth, with local swelling and later loss of function and ossification. Sometimes local and radiating pain is associated with it, and also slight febrile reaction. The skin may be of a higher temperature than normal, and the connective tissue oedematous. The swelling may disappear after two to four weeks, leaving the

muscle hard and ossified, a condition which is sometimes temporary, but generally spreads to the origin and insertion of the muscle, and remains permanent. The disease generally begins in the neck and back muscles, spreading and producing ever-increasing deformity. Münchmeyer reports twelve cases, of which nine were in males, which predisposition of males has been noted by other writers, Roth saying that of the thirty-nine cases which he collected from the literature thirty were males.

Some years later Helferich noted the occurrence of a curious malformation in connection with this disease—microdactylie, an ankylosis of the phalanges of the thumb and a lack of one phalanx of the great toe on both sides. Since his time the same curious anomaly has been noted in 75 per cent. of all the cases recorded. In 1869 Münchmeyer collected from the literature twelve cases of this disease. In 1884 Pinter carefully reviewed the literature and reports twenty-two cases with those of Münchmeyer. In 1896 Pincus very exhaustively reviewed the literature of myositis ossificans progressiva, carefully tabulating the thirty-eight cases which he found. Roth, in 1898, in his review of the literature, mentions having found forty cases, including his own, which number, however, includes the four cases of localized myositis reported by Cahen and one by Schwarz. Eleven of his cases were included in the table given by Pincus, leaving twenty-four which, with the thirty-eight of Pincus give sixty-two cases, which were reported by Skinner, Minkiewicz, Zollinger, Billroth, Byers, Florschütz and Gerber, Ditmeyer, Huth, Nicoladoni, Helferich, Partsch, Kümmel, Uhde and Pinter, Krause, Kohts, Simpson, Willett, Godlee, v. Volkmann, Lendon, Bókai, Macdonald, Svensson, Pollard, Brennsohn, Rabek, Virchow, Carter, Paget, Pincus, Mays, Berger, Storham, Maunz and Lexer in addition to those already mentioned. In an addendum Pincus cites cases from Gibney, Kissel, Linsmayer, Lexer, and Rosenstein.

In a careful review of the literature since 1890 I have found, in addition to those cited by Pincus and Roth, cases of myositis ossificans progressiva reported by Boks, Jones, Nissim, Stonham, Bernachi, Martinez, De la Camp, Lockwood, Bollinger, Jacoby and Morian-Essen, making eleven cases, which, with the sixty-seven collected by Pincus and Roth, make seventy-eight cases. Most of the cases to the reports of which I have had access follow so closely the description of Münchmeyer, already given, that a further reference seems unnecessary; but in one case, reported by Kissel, while the clinical picture was typical of the disease, the microscopical examination of one of the hard swellings revealed the presence of no true osseous tissue, but only of young connective tissue with some remnants of altered muscle. In this case also some of the tumors disappeared, leaving no trace, while others broke down, and a puriform liquid was discharged. This case improved somewhat under treatment, and was regarded by Kissel as an incipient stage

of the disease. The usual history of the disease is a slow progress with longer or shorter pauses, the general health remaining good, death finally ensuing either from some intercurrent affection or from starvation after the disease has involved the muscles of mastication and deglutition.

Cases of ossification confined to single muscles or groups of muscles have been reported by Podrazki, Schwarz, Cahen, Schmit, Lehman, Sieur, Lunden, Albertin, Hutchinson, Lalesque, Eineri, Ramonet, Gazni, Cordillot, Orion, Tricot, Mouchet and Munro, making twenty-three cases with the two reported by myself. In addition to these, Cahen has collected from the literature previous to 1890 twelve similar cases, which were reported by Volkmann, Virchow, Rokitansky, Schuh, Billroth, Otto, Pitha, Rasmussen, and Meinhold. Some of these cases followed a single severe injury, as in the four cases described by Cahen, in which the growth resulted from the kick of a horse. Other cases resulted from repeated injuries or from continued use or strain, under which heading we may include the ossification of the deltoid and arm muscles in soldiers and of the thigh muscles in riders. This perhaps includes far the largest number of this class of cases. Then we have ossification occurring in the course of a chronic inflammatory process, which may be rheumatic, syphilitic, or tuberculous.

Mays, Cahen, Lexer, Kissel and Kümmel have made microscopical examinations of cases cited by them, and the findings of Cahen and Lexer may be compared with my own; Cahen's, because his cases represent a type similar to mine; Lexer's, because he has examined some of the growths from a case of true progressive myositis ossificans.

In the case described by Cahen the tumor was removed, and after a short time returned and was again removed, this time with the periosteum, to which it had become adherent. The sections from these two growths present somewhat different appearances. At the periphery of the section of the first tumor, and crowded together by connective tissue containing many bloodvessels and large spindle-cells, he finds muscle which has undergone many degenerative changes—hyaline degeneration, increase of nuclei of sarcolemma, loss of striation, etc. In the centre of the tumor he finds irregularly arranged trabeculæ of bone, with an epithelium-like lining of osteoblasts, with many lacunæ and giant-cells, and the spaces filled with a marrow extraordinarily rich in bloodvessels and connective-tissue cells. All through the preparation are scattered bits of muscle, the relation being so intimate that single muscle fibres are completely embedded in bone. In the sections from the second tumor no muscle fibres are seen. There are three distinct zones: a zone of greatly increased connective tissue cells, then a zone of small-celled hyaline cartilage, which, by ingrowth of bloodvessels and giant-cells, is changed into bone. There is no distinct boundary between the

cartilage and bone, the cells becoming smaller and losing their capsules, while the intercellular substance becomes denser, more opaque, and stains bluish-red in the hæmatoxylin-eosin double-stain. The development of bone in all cases investigated stood in direct relation with an increase of the intermuscular connective tissue.

Lexer has described quite minutely the microscopical appearance of sections taken from several tumors removed from two cases of myositis ossificans progressiva. Near the periphery of the preparations he finds quite normal muscle fibres. Nearer the centre the muscle fibres are more or less degenerated, the cross striation lost, the muscle nuclei increased, in many cases resembling giant-cells, and the fibre broken up, while the intermuscular connective tissue is increased and infiltrated with leucocytes, especially in the region of the capillaries. The connective tissue contains many cells of different forms arising from division of connective-tissue cells, which may be considered as fibroblasts, while in some places are seen cartilage cells with formation of hyaline cartilage. Nearer the centre the ground substance becomes denser, the former connective-tissue cells lie in small angular spaces and the formative cells lie in rather regular rows on the dense tissue which comprises the osteoid trabeculæ. Later these become calcified, and thus bone is formed. The noteworthy point about this description is its similarity to that given by Cahen and the similarity of both to my own description. This, it seems to me, would indicate that, though the clinical picture differs much, because of the wide-spread distribution of the lesions in the progressive type, yet the pathological changes are nearly the same in the two types of the disease. This may, however, need further evidence.

Much difference of opinion has arisen as to the true character of the bone formation. Virchow places the disease on the border line between inflammation and new growth, and is supported by Lexer, Bollinger and many others.

Mays asserts that it is a true tumor, and is supported by Kümmel, Pinter, Helferich, Pincus, Partsch, Schwarz, Cahen and others. Cahen bases his assertion on the microscopical appearance, especially the fact that new connective tissue, cartilage, osteoid tissue, and bone are found in the same section, thus showing the characteristics of an atypical growth. They consider the inflammatory phenomena and muscle degeneration to be secondary to the tumor formation. Pincus, after a most exhaustive and careful study of the literature of myositis ossificans progressiva and of his own cases, arrives at the following conclusions: The so-called myositis ossificans progressiva multiplex is not a disease, but undoubtedly a tumor belonging to the multiple osteomata and exostoses of Virchow. The process begins in the periosteum, the muscle degenerating secondarily. At the foundation lies an inborn — not

hereditary—constitutional anomaly, the Cohnheim theory of embryonic nuclear *anlagen* not sufficing for explanation; the constitutional anomaly is to be defined as vulnerability (excessive productivity) of the periosteum and connective tissue of the locomotor apparatus. The disease needs for its development an external cause. As etiological factors we have, above all, trauma; in a less degree rheumatism. Syphilis, rhachitis, myopathy, and trophoneurosis are excluded. The apparently spontaneous cases arising in early life are really of traumatic origin and due to intrapartum injuries.

Nicoladoni advances the hypothesis that the process is a tropho-neurosis comparable to progressive muscular atrophy and pseudohypertrophy of muscle, but finds no active supporters, although Klemm advances some arguments which seem to support his view, while Schwarz, Eichhorst, and Klemm consider it secondary to a disease of the spinal cord.

Since electrical tests, wherever applied, have seemed to indicate an entire absence of any neuropathic factor, except in the cases of Kümmel and Pincus, where the faradic excitability was much reduced in the degenerated muscles, it seems feasible to consider the disease purely myopathic, either primarily inflammatory in character or having the primary characteristics of a new growth. It seems probable that in the progressive form of the disease many of the swellings are true neoplasms, while others, as would seem to be indicated by Lexer's description, result from an inflammatory process.

Nicoladoni says that in consequence of a diffuse interstitial myositis an indifferent tissue arises which can develop in two different ways: scar tissue and bone. Lexer corroborates this from his microscopical findings, as the tissue arising from proliferation of the connective-tissue cells can, by formation of new fibrillæ, develop into a firm, scar-like tissue as well as undergo a further change into cartilage and bone. Düms believes it the result of irritation of connective tissue through trauma or blood extravasation, and formation of indifferent granulation tissue from which the subsequent developmental changes arise.

In the myositis ossificans limited to single muscles, my observations would, it seems to me, indicate that the primary condition is an inflammatory process in the intermuscular connective tissue, resulting in degeneration of the muscle fibres, either from simple pressure atrophy or from fatty degeneration, so that the name myositis interstitialis ossificans, as suggested by Stonham, seems not inappropriate. The second condition seems to be the establishment of the processes of repair, the formation of a tissue rich in fibroblasts and small bloodvessels, in which white fibrous and yellow elastic tissue fibres are sparingly developed. Before this process proceeds to the formation of mature connective tissue, however, it is interrupted by the change of a part of the tissue to trabeculæ of firm osteoid substance which becomes calcified, while the parts en-

closed by the trabeculae change to bone-marrow. This change is not so anomalous that it need excite great surprise, since, as is well known, the different members of the connective-tissue groups change with especial readiness to some other form of connective tissue. Bone when broken heals by formation of fibrous tissue, which normally changes to bone, but may remain fibrous in adult life, the cartilages of the larynx and trachea ossify, and other similar changes may occur under certain circumstances.

Many factors have been assigned as exciting causes of this affection: such as cold, unsanitary surroundings, trauma, either slight or severe, either a single injury or many successive injuries, irritation, as in the exercise of bone, or chronic disease processes.

This might be satisfactory on the subject of etiology, were it not that the exciting cause, which most authors admit as a necessary factor in producing the disease, is often so slight and trivial that we cannot believe it sufficient to produce the disease in a normal individual. This is especially true in cases of the progressive type, while in the stationary form of the disease the irritant cause which has operated on hundreds of cases has produced ossification in very few. The explanation of these facts has opened a large field for conjecture and speculation. Virchow believes that there is in these individuals an ossifying predisposition, either hereditary or congenital, which he calls "diathesis ossificata sive ossea."

Mays, Kümmel, Pinter, Helferich, Schwarz, Pincus, Stonham, Paget and many others ascribe it to a congenital, not hereditary, predisposition, which they do not define more exactly.

Maunz suggests as a predisposing causative factor a disturbance of embryonic development. He says: "In the *anlagen* of musculature, where in later life pathological bone formations occur, osteoblastic nuclei enter. These nuclei remain dormant so long as they are held in check by the physiological resistance of neighboring tissues. If, however, this be weakened, the bone *anlagen* develop into the pathological bone formation." He explains in a similar way the occurrence of exostoses and osteophytes which are so frequently found in conjunction with the muscular ossification. Those who favor the view of embryonic disturbance cite the frequent occurrence of microdactylie in this disease as an evidence favoring their hypothesis.

Brennsohn and others suggest the idea that the disease is due to atavistic influence, without, however, expressing any positive belief in the hypothesis. The microdactylie is cited as favoring this theory also. Dr. Warthin is inclined to favor this suggestion in the case of the localized form of the disease. He believes that a sharp distinction should be drawn between the two types, the growths being true neoplasms in the progressive form of the disease, while in the localized form, in which

he includes the inflammatory ossification and the exercise and riders' bones, whose site is quite distinctly limited to the thigh and shoulder muscles, we have an atavistic reversion to the splint bone of lower animals.

Direct heredity seems, from the history of the cases reported, to play no rôle in the causation of the disease, if we except the fact noted by Paget that in many cases rheumatism and cancer occur in the family history.

Atavistic influence seems to me to be contraindicated by the fact that in the hand and foot, where splint bones are most common in the lower animals, these bony growths rarely occur. In the progressive muscular ossification, beginning in early life, it may, it seems to me, be necessary to admit the hypothesis of a congenital condition consisting of an abnormal activity of osteoblastic elements, or, if we accept the Weisman theory of embryonic development, the persistence of indifferent, undifferentiated mesenchymal cells, which, under the requisite conditions of nutrition, develop abnormally into nodules of fibrous connective tissue, cartilage, and bone, sometimes in connection with the skeletal bones, sometimes in fascia, tendons, ligaments, or intermuscular connective tissue. In the localized form of the disease, however, no such hypothesis seems to me to be necessary. We have here a formation of granulation tissue, a new connective tissue, whose cells may therefore revert to the undifferentiated, indifferent embryonic cell type, mesenchymal cells, which may develop into fibrous tissue, cartilage, or bone, according to the prevalent nutritive conditions. Although Gegenbaur suggests the possibility that specialized osteoblastic nuclei are necessary for bone development, the ordinary connective-tissue cells being incapable of such development, there seems, in these cases, no valid reason for the belief that the cells, which in certain regions act as osteoblasts, are histogenetically different from those which, in other localities, develop into fibrous connective tissue.

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SARCOMA OF THE SMALL INTESTINE.

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DURING the past two years there have been observed at the Mount Sinai Hospital five cases of intestinal sarcoma, four of which came to autopsy. In three of these cases the clinical picture closely resembled that of appendicitis. In attempting to ascertain whether such a resemblance had before been noted, I found that not only was the clinical picture unknown, but also that there had been no complete review of the subject of sarcoma of the intestine since Baltzer wrote his article in 1893.

In the following paper I shall give the details of the four cases of ours which came to autopsy, and refer occasionally to the fifth case. I shall then attempt to give a complete picture of the disease from all its stand-points. I am indebted to Dr. Gerster for his kindness in permitting me to observe four of these cases clinically, to Dr. Lilienthal, in whose service the fourth case occurred, and to Dr. Brewer, by whom it was operated upon.

CASE I.—H. G., aged twelve years, schoolboy, admitted September 30, 1898. History is of nine days' duration. The boy first complained of pain in the abdomen, below and to the right of the umbilicus, and of weakness. Three days ago abdominal distention was noticed, and since then there is marked constipation. The distention and pain have increased, and the boy suffers from dyspnœa.

On admission the temperature was 100.6°. The status in short was the following: Superficial abdominal and thoracic veins distended. Liver: upper border of dulness at fifth space, lower border undetermined. Abdomen much distended, signs of free fluid. Across the hypogastric region and extending into the pelvis there is a nodular tumor, concave above. Rectal examination revealed a large bulging mass anteriorly.

Operation, on October 1st, by Dr. Van Arsdale. The peritoneum was found lined with white nodular masses, and a large amount of chyloform fluid escaped. After the operation the boy gradually became weaker, there developed a left-sided empyema, purulent peritonitis, and otitis media. He died on October 29th.

Post-mortem Examination. (Abstract.) Lungs: large purulent exudate in left pleura. Small abscess in base of left lung. Infiltration of the diaphragm and base of the left lung by new growth. Evidences of healed tuberculosis in the right lung. Spleen: infiltrations on surface.

Kidneys: in the medullary rays brown streaks looking like uric acid infarcts; growths on anterior surface. Pancreas: diffusely infiltrated. Liver: size normal; fatty; covered by flat growths, white in color, some of which involve the parietal peritoneum. The wall of the gall-bladder is uniformly infiltrated. The omentum and mesentery are very much thickened, due to infiltration by tumor masses. The mesenteric nodes are all very large, and on section are white, homogeneous, and dry. Stomach: walls diffusely infiltrated. Intestinal coils are bound together, by masses between which are sacculations of green pus. The parietal peritoneum is not involved, except over the liver. The intestinal coils are attached to the bladder by some of the growths. The walls of the colon and part of the ileum show a thin infiltration with the new growth, the mucosa not being involved. In the duodenum, eight centimetres from the pylorus, is a large growth which encircles the gut, and projects into its lumen. The growth measures seven centimetres in length, five in width, and six in thickness. It encircles the gut, and projects into its lumen; the mucosa is intact. Microscopical examination: lymphosarcoma. (Some of the details of the microscopical findings will be given later.)

NOTES. In this case of sarcoma of the duodenum, with extensive metastases, there existed stenosis of the intestine, which, as we shall later see, is the exception to the rule. The case was sent into the hospital with the diagnosis of "appendicitis." The diagnosis made in the hospital was "new growth of the peritoneum, probably sarcoma."

CASE II.--A. R., aged three and one-half years, admitted December 23, 1898. History of eight days' standing. The child complained of abdominal pain, and the abdomen was seen to be enlarged and rigid. Bowels moved freely, but there was difficulty in urination. During the last three days the child vomited several times, and was feverish. The feet were not swollen.

The physical examination revealed the following: The liver flatness begins at the sixth rib, and extends four centimetres below the free border. Spleen is enlarged to percussion. The right side of the abdomen is occupied by an irregularly-shaped mass extending to the median line, easily pushed about, moving freely with respiration. The lower limit seems to be at the umbilicus. The surface feels irregular, as if the mass were composed of lymph nodes. The abdomen is symmetrically distended. There are some hard, round masses to be felt just above the groins. Temperature 100.8°.

25th. Urine contains considerable indican. Catheterization found necessary. Blood examination shows a moderate secondary anæmia and moderate polynuclear leucocytosis.

31st. Abdominal distention more marked. Intense dyspnœa.

January 5th. Operation by Dr. Gerster. Peritoneum found very much thickened. Some ascitic fluid escaped. The intestines were found adherent to each other, and to the omentum. The patient died on the following day.

Post-mortem examination showed the following changes: Lungs: large effusion of clear fluid in the left pleura. Abdomen: very much distended. The mesentery and omentum are everywhere thickened and whitish. All the intra-abdominal lymph nodes are enlarged, some being

four centimetres in diameter. On section they are white, succulent, soft. In the beginning of the ileum there is a large, white tumor infiltrating the wall, especially opposite the mesenteric attachment. The main tumor mass measures seven by eight centimetres, and is about three centimetres thick. On opening the intestine the growth is found to be indurated, and has an elevated irregular edge. Except for a few small areas of necrosis the mucous membrane is intact. The part of the ileum involved is considerably dilated, the circumference there being three times as great as that of the uninvolved part of the intestine. There is also an infiltration of the wall of many of the intestinal coils, and the coils are adherent to each other. The iliac lymph-nodes are very much enlarged and adherent to the bladder wall, which is much thickened and nodular. The ureters are partially obstructed by the tumor. The parietal peritoneum is involved, but to a lesser degree than the mesentery and omentum. Spleen: moderately enlarged; few nodules on the surface; slight infiltration along the vessels coming from the hilus. Pancreas: entirely infiltrated and very much enlarged. Kidneys: normal in size; cut surface yellowish. In the left kidney there are a few small nodules. The pelves of both kidneys are somewhat dilated, the left more than the right. Left adrenal entirely replaced by new growth, and adherent to the pancreas. Stomach: wall whitish and thickened. Liver: very much enlarged. Almost the whole right lobe is light brown in color, and is separated from the normal liver tissue by a raised edge. This lighter part is hard on section, and appears to be uniformly infiltrated by new growth. There are also a number of small, hard nodules present. The liver as a whole is somewhat fatty. Gall-bladder: distended with a colorless mucoid fluid; the neck of this organ is much thickened by new growth, and the cystic duct is impassable. Appendix is eleven centimetres long; the wall is much thickened and uniformly infiltrated with new growth. Bronchial nodes present the same appearance as the intra-abdominal nodes. Microscopical examination: lymphosarcoma.

NOTES. This second case is an instance of a primary intestinal sarcoma with dilatation and with the most extensive metastases yet reported. The diagnosis before operation wavered between sarcoma of the kidney, tubercular peritonitis, and sarcoma of the peritoneum, with a possible primary intestinal tumor. The clinical history, except for the bladder symptoms, was rather typical.

CASE III.—M. G., aged eighteen years; Russia; admitted January 22, 1899. History is of one day's standing; began with abdominal pains, most marked on the right side below the umbilicus. Bowels moved yesterday. Has been vomiting since last night, vomitus being bile-colored. No history of any previous attacks. Status: Hippocratic appearance; breathing rapid and shallow; pulse almost imperceptible; legs drawn up; abdomen tense and hard, uniformly tympanitic. By rectum a large doughy mass is felt high up. Operation by Dr. Van Arsdale. Saline infusion. The abdomen was opened in the right iliac fossa, and a large amount of fluid, fecal matter, and serum poured out. The appendix was found normal. The abdomen was then opened on the left side, and the peritoneal cavity irrigated.

Temperature on admission 103.6° , respirations 50, pulse 100, almost imperceptible. Freely stimulated. After operation pulse rapidly gave out.

The *autopsy* showed the following: In the jejunum, one and one-third metres from the duodenum, is a perforation in the intestine measuring seven by eight centimetres in diameter, with an irregular edge. The perforation is due to a tumor which has infiltrated the wall of the intestine and dilated it. The growth is white and soft on section, and varies from one-half to two centimetres in thickness. The tumor surrounds the circumference of the intestine, except for a space of three centimetres on the mesenteric side. Just above the tumor in the mesentery anteriorly is a node which looks cheesy. Posteriorly there is a lymph node infiltrated with sarcoma. There were no metastases found.

Microscopical examination of the tumor and the infiltrated nodes shows lymphosarcoma.

NOTES. This unique case is an instance of intestinal sarcoma which produced no marked symptoms until perforation occurred. The diagnosis of general peritonitis, probably due to perforation of the appendix, had been made.

CASE IV.—M. M., aged forty-two years, admitted January 8, 1900. For the last two weeks the patient has had irregular abdominal pain. During the past week he has suffered from frequent urination. No blood was passed, nor was there a urethral discharge present. Four days ago he was seized with severe abdominal pain, especially marked in the pelvis. There has been absence of fever, chills, and vomiting. The bowels were constipated until yesterday, although cathartics and enemata had been used. Within the last four days the patient has noticed a mass low down in the abdomen, which has grown rapidly and has become very tender.

The physical examination of the emaciated patient revealed an irregular tumor in the hypogastric region, extending into both iliac fossæ, especially the right. The tumor is quite tender, rather hard, but gives the sense of deep fluctuation. The rectal examination shows a hard symmetrical bulging. The temperature was 101.4° ; the urine contained albumin, pus cells, and hyaline and pus casts.

Operation on day of admission by Dr. Brewer. On opening the abdomen a very large hemorrhagic tumor was found springing from the ileum and adhering to the right iliac wall, the floor of the pelvis, the large vessels, and the bladder. After much difficulty the tumor, together with two inches of the small intestine, was removed, and a Murphy button anastomosis performed. The patient died three days later from acute peritonitis.

The description of the tumor is as follows: It springs from the ileum at a distance of seventy centimetres from the valve. At its point of attachment to the intestine there is a beginning diverticulum. The tumor is very irregular in shape, and consists in general of two more or less reniform parts. The greatest width of the tumor is fifteen centimetres, the length thirteen centimetres, and the thickness eight centimetres. One-half of the growth is entirely hemorrhagic and cystic,

and the other half is necrotic and cystic. On cutting the tumor open it is found to begin in the submucosa, reaching to the mucosa, but not involving it. Microscopical examination: spindle-celled sarcoma.

Of the *autopsy* notes only the following are of special interest: The spleen shows acute inflammation and hemorrhages. The kidneys show chronic nephritis, with acute degeneration. In the liver there is a marked pigmentation presumably due to absorption of blood from the tumor. There are no metastases present.

NOTE. This case was one of a solitary tumor of the intestine, which clinically bore the closest resemblance to acute appendicitis, the acuteness of the symptoms being due in all probability to the hemorrhagic extravasation.

ETIOLOGY. *Frequency.* A glance at some statistics will be necessary to show the frequency of sarcoma of the intestine, and the comparative frequency of sarcoma and carcinoma. From 1859 to 1875 there was no case of intestinal sarcoma observed in the Berlin Pathological Institute. On the other hand, Smoler reports thirteen cases in Prague in fifteen years among thirteen thousand and thirty-six autopsies. Nothnagel states that in twelve years there came to autopsy in Vienna twelve cases of intestinal sarcoma. This certainly indicates that the disease is an unusual one. Possibly the occurrence of four cases of lymphosarcoma in our service in a very short time would tend to show that we may have to deal with an endemic disease, for, as we shall later see, there is reason to suspect these tumors to be of infectious origin.

Compared to the total number of lymphosarcomata the intestinal cases are not very infrequent. Nothnagel's figures show that among two hundred and seventy-four sarcomata three involved the intestine, and of sixty-one lymphosarcomata nine were primary in the intestine.

As to the frequency compared to carcinoma, Mueller reports five hundred and twenty-one cases of carcinoma, of which forty-one occurred in the intestine, and one hundred and two cases of sarcoma, with only one instance of intestinal involvement. Similarly, Nothnagel's figures show that among two thousand one hundred and twenty-five carcinomata two hundred and forty-three occurred in the intestine; of two hundred and seventy-four sarcomata three occurred in the intestine, and among sixty-one lymphosarcomata there were nine of the intestine. So that sarcoma of the intestine is much more uncommon than carcinoma.

Location. Sarcomata have their seat of preference in the small intestine. In the large intestine they are much more uncommon, except in the rectum, where they occur quite as frequently as in the small intestine. A few figures will illustrate this. Krueger gives the following statistics of thirty-seven cases: Small intestine, sixteen; ileum and

cæcum, one ; cæcum, two ; appendix, one ; transverse colon, one ; small and large intestine, one ; rectum, sixteen. Nothnagel's figures are as follows : Of nine lymphosarcomata one involved the duodenum ; three the jejunum ; three the ileum, and two the cæcum. Of three sarcomata one occurred in the ileum ; one in the cæcum, and one in the rectum.

Age. Baltzer states that 58 per cent. of the cases occur in the fourth decade, and in eleven of his fourteen cases the age was not over forty. I have collected fifty-one cases in which the age is noted. The results are as follows : First decade, six ; second, nine ; third, thirteen ; fourth, thirteen ; fifth, eight ; sixth, one, and seventh, one. This shows that the age cannot be used as a diagnostic point. The oldest patient was seventy (Smoler). The youngest was a congenital case reported by Stern. This case was that of a child which died when five days old with symptoms of intestinal obstruction. There was found at autopsy a round-celled angiosarcoma of the jejunum.

Sex. Baltzer's cases, with one exception, were all males. I have collected fifty-nine cases including Baltzer's. Among these we find thirty-five males and fourteen females ; or, in other words, the disease seems to be more than twice as common in males as in females.

Cause. As to the causation but little is known. In several instances the disease developed after a trauma, the usual interval until these symptoms developed being five to six weeks (Jalland, Pepin). In one case there is a previous history of syphilis. In another (Nothnagel) it followed a tuberculosis of the intestine. Flexner, in reporting two cases, drew attention to a histological feature of the growth, which he believed might throw a hint as to the cause of lymphosarcoma. He found in the growth in the stomach, intestine, and kidneys (most distinctly in the last) certain peculiar bodies. These were oval, round, or slightly irregular in shape, and consisted of a rim of protoplasm staining faintly with eosin, and enclosing a particle staining with hæmatoxylin. The last was oval or crescentic, and lay either in the centre of the cell or eccentrically. The bodies were distributed irregularly in the diseased areas, and an occasional body was seen in the adjacent parts. Flexner believed that they were probably protozoa, but stated that they might have no causal relationship.

I have found these bodies in the sections from the involved organs in our cases of intestinal lymphosarcoma, and also in specimens from other cases of lymphosarcoma. Although in places they at first impress one as probably being fragments of cells disintegrated by the infiltration of the new growth, a careful examination shows that such a view is not tenable, and one must agree with Flexner's view that they are at least suspicious.

PATHOLOGY. Location and Size. I have collected forty-two cases in which the location is given. Of these, fifteen occurred in the duod-

enum ; eighteen in the jejunum ; two involved the jejunum and ileum ; fourteen the ileum, and three the entire intestinal tract. These figures show that the larger number of sarcomata occur in the jejunum and ileum, but they may be located anywhere. The tumor may be single or multiple, small or large.

Varieties. The varieties of tumor found are : spindle-celled sarcoma, lymphosarcoma, myosarcoma, endothelioma interfasciculare, round-celled sarcoma, melanosarcoma, and mixed-celled sarcoma. Some round-celled sarcomata might better be classed with the lymphosarcomata.

When sarcoma occurs in the intestine it is generally primary there. It may, however, be secondary, or it may be part of a general lymphosarcomatosis. In this article we shall direct our attention to the primary cases only. In most of the cases the growth is confined to the mucosa and muscularis, and the serous coat is entirely or nearly entirely free. In a very few instances the growth began in the serosa, and later involved the inner coats. The lymphosarcomata, which formed the largest group (seventeen cases), generally begin in the submucous lymphatic nodules, and have a tendency to grow longitudinally. The muscularis is early infiltrated and paralyzed, and the feces dilate the intestine. This dilatation is a peculiar though not a constant feature of intestinal lymphosarcoma.

METASTASES. I have arranged these according to the character of the growth. Among the cases reported with microscopical examination there are five instances of spindle-celled sarcoma. Four of these had no metastases ; one had metastases in the peritoneum and liver. The location of the tumor is not always given, but one was in the ileum, and our case was also in the ileum. Of the lymphosarcomata (seventeen cases) three involved the duodenum ; four the jejunum ; three the ileum ; one the appendix ; one the ileum and jejunum, and one the whole intestinal canal. Metastases occurred as follows : In three cases there were none ; in most of the cases the mesenteric nodes and other parts of the intestinal walls contained growths. The liver was involved seven times ; the kidney seven times ; the spleen three times ; the pancreas once ; the adrenals once ; the diaphragm twice ; the rectal wall twice, and the bladder four times.

Among the numerous other reported cases we will give details of a few only. In the case of Nicolaysen (myosarcoma) a few nodes in the mesentery were involved, and in Lehmann's case of endothelioma the whole intestine except twelve inches was involved. Of the round-celled cases (four) two involved the jejunum and two the ileum. In one case there were no metastases ; in another there were growths in the mesentery, and in the third the kidneys and upper part of the rectum were infiltrated. In Treves' case of melanosarcoma of the ileum the inguinal glands were infiltrated.

These data all go to show that the spindle-celled sarcomata have few or no metastases. The lymphosarcomata generally have extensive metastases, every abdominal organ and tissue being liable to invasion. The superficial lymph nodes are not generally involved. The metastases occur most commonly in the peritoneum, lymph nodes, liver, and kidney. There is a marked tendency for the growth to occur in the pelvis or for the original tumor to become adherent there. In our first two cases the growths seem to have been more extensive than in any other cases hitherto reported. A careful examination of the specimens showed that the growth extended almost entirely by continuity, or by contact. In the liver the growth extended inward from the surface, or along the vessels. The spleen and kidneys showed the same.

The parietal peritoneum was implicated only by extension from the visceral peritoneum. This opposes the statements made about the discontinuous growths of the lymphosarcomata, and strengthens the impression that these growths are infectious in nature, and that we are not dealing with metastases in the true sense of the word.

MICROSCOPICAL EXAMINATION. I shall confine myself here to a few notes of my own cases. The fourth case needs but little commentary. In the other three cases the picture was that of a typical lymphosarcoma. I might mention, however, the great number of large lymphatic capillaries in some of the growths, and the frequent occurrence of the growth in the lumina of these capillaries.

In the first case the main growth was found in the submucosa, and through slits in the muscularis mucosæ the sarcoma cells reached up between the tubules. In some places the muscularis was entirely replaced by new growth. In the mesentery, omentum, and intestinal wall the tumor seemed to pass along under the serosa. The mucosa of the intestine above and below the growth showed no particular changes. The liver showed acute degeneration and congestion. The infiltrations in it followed the vessels, and tended to surround the lobules. There was some increase of the connective tissue between the lobules in the parts of the organ which were not infiltrated. The capsule was distinctly thickened. In the kidneys there was present a marked degeneration and congestion.

In the second case the sarcoma cells could very frequently be seen in the lymphatics. The liver showed fatty degeneration and infiltration and acute congestion. The growth seemed to spread between the liver cells, and at the edge of the infiltration the liver cells were almost entirely replaced by fat, or appeared to be necrotic. Near the growth the bloodvessels were much dilated. At a distance from the growth there was a marked parenchymatous degeneration, but less fatty infiltration. In one place there were small calcific deposits. The spleen was congested and hemorrhagic. The infiltration spread

here also along the connective tissue and around the vessels, and there could frequently be seen an infiltration about the vessels in the Malpighian bodies. In the kidneys there was found an acute congestion and degeneration. The infiltration occurred between the tubules, and in the areas involved the tubular epithelium was very indistinct. The stomach was diffusely infiltrated, even the mucosa being involved. In the gall-bladder the infiltration involved the submucosa only. The mucosa of the intestine above and below the primary growth for a short distance stained homogenously and showed no distinct structure.

In the third case there was a cheesy gland in the mesentery, but microscopically this proved to be lymphosarcomatous in nature. In the fourth case we will note only that the liver was markedly pigmented, that the kidney showed an acute parenchymatous degeneration, that the spleen was acutely inflamed and hemorrhagic, and that the heart presented a brown atrophy.

I have given the microscopical report of these cases to bring out the following points :

1. The transmission alongside the vessels, and the growth in the lymphatics in the lymphosarcoma cases.
2. The marked degeneration in those portions of the liver next to the new growth. Schulz (*Archiv für Heilkunde*, Band xv., p. 193) cites several instances of lymphosarcoma of the liver, stomach, intestines, and kidneys in which the epithelium near the growths was swollen, very granular, often fatty and disintegrated.
3. The parenchymatous degeneration of the liver and kidneys as a whole. In our second and fourth cases this must be explained as being due to the absorption of toxins or allied substances from the growths, and this again points to their probable infectious nature.
4. The fact that a cheesy gland may be lymphosarcomatous (*infra*).
5. The brown atrophy of the heart in the last case indicates a long continuance of the growth before the occurrence of distinct symptoms.

Flexner noted in his two cases extensive atrophy of the mucosa of the entire intestinal tract. In our case no such change was present, except to the slight degree noted in the second case.

RESULTS OF THE GROWTH. (a) *Dilatation and Stenosis*. As pointed out by Kundrat, Treves, and Baltzer the lymphosarcomata cause dilatation of the intestine. This may be aneurismatic in form, as in the cases of Haas, Bessel-Hagen, and in our second case. Occasionally the tumor causes stenosis, but there is no case on record of complete stenosis due to obturation of the lumen by the tumor. Rutherford stated that the higher up the tumor lies the less likely is there to be stenosis. But we have noted that the stenoses have been found most commonly in the sarcomata of the duodenum. When a complete obstruction has been found it has been due to one of the following causes :

(1) Invagination (Wallenberg); (2) twisting of the mesentery, due to the tumor being caught in a hernial sac (Waldenström); (3) adhesions (Schmidt). The tumor may be attached to the intestine by a pedicle, as in Lannelongue's case. In our fourth case the tumor had produced a small diverticulum in the wall by traction.

(b) *Results of Compression.* The tumor may compress:

1. The vena cava, causing œdema of the legs and ascites.
2. The bile ducts, and pancreatic duct (Lancereaux, sarcoma of the duodenum). In our second case the cystic duct was obstructed.
3. Ureters. This occurred in our second case, and resulted in a hydronephrosis of a moderate grade.

(c) *Ulceration and Perforation.* Ulceration is quite common, and may result in perforation, such perforation being either closed off by intestinal coils, the bladder or rectum, or opening directly into the general peritoneal cavity. The perforation may occur in any part of the intestine. The ulceration may expose vessels (Rolleston, sarcoma of the duodenum, erosion of the inferior pancreatico-duodenal artery). It is possible for these tumors to rupture without ulceration (Zuralski).

(d) *Changes in Other Parts of the Body.* The general changes and metastases have been described above. The pleural cavities may contain clear fluid or pus. There may be a localized or general peritonitis, the effused fluid being chyliform, clear, purulent, or hemorrhagic. There are practically no reports of a careful examination of the effusions in these cases. In the case reported by Henoch the fluid was hemorrhagic and contained numerous round cells showing fatty degeneration. We shall later give the details of the fluid in our fifth case.

(e) *Connection with Other Diseases.* In one case there was found a mixed-celled sarcoma of the ileum and an adenocarcinoma of the pylorus (Smoler). More important is the fact that lymphosarcoma has frequently been found in persons having either an intra-abdominal tuberculosis or a florid or healed tuberculosis elsewhere. The exact connection is not understood. While not attempting to state that a combination of tuberculosis and lymphosarcoma is not frequent, we believe that only cases in which a microscopical examination is reported should be credited, for just as Sternberg has shown, that a lymph node that looks lymphosarcomatous macroscopically may be tubercular on microscopical examination, so I have shown that the opposite mistake can be made.

SYMPTOMATOLOGY. *General Description.* Nothnagel gives us a good outline of the disease when he states that there is very early and without exception a marked affection of the general system and but few local symptoms. Baltzer's description, which has been quoted in most of the books, is as follows (abstract): "The symptoms are very slight at the onset. There is at first pain in the stomach, loss of appetite, nausea, vomiting; the bowels are irregular, being either constipated or

loose. The abdomen soon becomes distended. When seen early all the patients are very thin and have a pale color. A tumor is generally found, although it may be missed for a long time; it may be located in any part of the abdomen, and it is generally but slightly or not at all tender. The temperature is normal or moderately elevated. In some cases there is a leucocytosis. The duration of the disease varies from two weeks to one and three-quarter years, but most of the patients died within nine months."

DETAILED SYMPTOMATOLOGY. *Pain* is present in practically all the cases. It may be mild or severe, and may be located in any part of the abdomen. In most cases the pain is referred to the stomach, and occasionally it is especially marked after meals. In three of our cases the pain was specially referred to the region of the appendix.

Distention of the Abdomen is very common, being uniform or irregular. Its onset is frequently sudden, and the symptoms of the disease may date from its appearance. The swelling may rapidly increase or remain at a standstill, later to become suddenly more marked. The distention is due either to involvement of the peritoneum, pressure on the vessels, perforation of the intestine, tympanites, or the size of the tumor. If fluid is present it may be clear, chyliform, purulent or hemorrhagic. In our first case it was chyliform, in the second clear, and in the third fecal. In the fifth case a paracentesis abdominis was made, and the fluid showed the following: It was cloudy, yellow, odorless; its specific gravity 1014. There was present a trace of urea; albumin, 0.12 (.1290) per cent. Microscopically there were found a large number of pus-cells, red blood-cells, and some epithelial cells, numerous cocci and bacilli. Culture showed the bacterium coli commune.

CHARACTERISTICS OF THE TUMOR. In some cases a tumor cannot be made out. If a tumor is discovered it may be first found by examination, or it may be the symptom which leads the patient to consult a physician. After the tumor is once there it may grow very rapidly. The growth may be large or small, single or multiple. The lymphosarcomata often feel like one irregular tumor, whereas in reality the growth in the intestine is very small, and the irregularity is due to growths in the peritoneum and lymph nodes. At times small nodules are found which feel like lymph nodes, but which on post-mortem examination prove to be infiltrated appendices epiploicæ. The tumor may be superficial or deep. It may be possible to feel one large tumor and scattered nodules all over the abdomen, some feeling as if they were in the parietal peritoneum. Such an observation was made in our second case.

The tumor is generally only slightly or not at all tender. Marked tenderness occurred in only one of our five cases. The growths usually move with respiration, and can generally be moved around in the abdo-

men. The note over them is generally dull or dull tympanitic. Their consistency is generally moderately hard, although very soft and very hard ones have been described. The centre may show indistinct fluctuation, as in our fourth case. Crepitation may be felt over the tumor, and the latter may be seen to take part in the peristaltic movements of the intestine.

The position of the mass is most variable, but a large number of them tend to grow downward, or the growth occurs primarily in the lower part of the abdomen. As a result a rectal examination may reveal a tumor when nothing or only small nodules can be felt in the abdomen. In three of our cases parts of the growth could be felt by the rectum.

Symptoms Due to Compression. These may be summarized as follows: 1. Ascites or œdema of the legs and scrotum, the latter two being important symptoms. 2. Distention of the veins of the abdominal and thoracic walls. 3. Jaundice and alcoholic stools. 4. Dysuria and diminution in the amount of urine.

Gastric Symptoms. Loss of appetite and vomiting are of frequent occurrence. The vomited matter may contain bile, especially if the tumor is high up, but vomiting of blood is exceptional, except when as a terminal symptom. In our fifth case hæmin crystals were found in the vomitus comparatively early in the disease. In Stern's congenital case meconium was present. The gastric pains have been referred to.

Intestinal Symptoms. There is generally some disturbance in the movements of the bowels, although the exact character varies. Thus there may be always constipation or always diarrhœa. There may be first constipation, and then diarrhœa, or they may alternate. More characteristic is an early diarrhœa followed by persistent constipation. The constipation is not absolute, except when some complication is present, as already referred to. Rarely "erectations of the intestine" may occur (Schmidt). The movements may contain pus and blood, although the admixture of blood generally speaks for involvement of the large intestine.

Hepatic Symptoms. The liver has generally been described as not being enlarged, but in three of our cases there was quite marked increase in size. Rarely jaundice is present.

Pulmonary Symptoms. Dyspnœa is not uncommon, being due to pleural effusions, the abdominal distention, or the weakness and anæmia. The pleural effusion is bilateral or unilateral, and the fluid is serous or turbid or hemorrhagic.

Urinary Symptoms. The urine may be scanty and contain much urates. Albumin is frequently present, pus and blood rarely. There may be difficulty in urination of even marked degree, as in our second case. The urination may be very frequent and painful.

Cutaneous Symptoms. Sweating is not uncommon, especially at night.

The œdema of the legs and scrotum, due to pressure or hydræmia, may occur quite early. There may even be a general slight anasarca. The veins of the abdominal wall and thoracic walls may be prominent. Of great importance is the appearance of a peculiar white color in the face, which may come on suddenly, and usually appears after the abdomen is distended. This rather characteristic color appeared in our first two cases very early, but in the fifth case it was first noted a few days before death.

External Lymph Nodes. These are not generally enlarged. But in a case of melanosarcoma of the ileum, reported by Treves, there was a swelling in the left groin which was suspected of being a hernia, but which proved to be a lymph node containing metastases.

Temperature. The temperature may be quite normal throughout the disease, but is more common to find evening rises to 101°, 102°, or 103°. Our cases all had febrile movements.

Emaciation and marked loss of strength are generally prominent features. They were present in all our cases, but developed in the fifth case very late.

Blood Changes. Here there is nothing characteristic, although anæmia and leucocytosis have been described. Schmidt made a careful examination of the blood in two cases, and noted in both a diminution in the amount of fibrin and an increase in the number of hæmatoblasts. In our second case an examination showed a moderate secondary anæmia, with slight polynuclear leucocytosis.

Course of the Disease. A consideration of the symptomatology as just given will show that the descriptions given by Baltzer and Nothnagel will not fit many of the cases. I have therefore endeavored to classify the varieties of the disease in the following way :

1. Latent cases, the disease being first discovered at autopsy.
2. Cases with the clinical picture described by Baltzer, either the general symptoms, the distention of the abdomen, or the tumor being first noted.
3. Cases in which the first symptoms are due to an intussusception or other variety of intestinal obstruction or to perforation.
4. Cases resembling tubercular peritonitis.
5. Cases in which jaundice is the first symptom.
6. In one case there was the closest resemblance to an ovarian cyst.
7. Finally, the cases may bear a very close resemblance to appendicitis, an observation made for the first time in our cases.

DIAGNOSIS. Of all the symptoms just detailed the following are important for the diagnosis : the presence of a tumor (rectal examination) which is not markedly tender, abdominal distention, absence of symptoms of stenosis, early œdema of the legs, the lack of involvement of the external lymph nodes, the emaciation, the peculiar color, the absence

of marked ascites. But none of these symptoms is absolutely constant. It is very difficult to establish any exact rules for diagnosis, as any one observer is apt to see but few cases. We shall endeavor to give a few hints and to indicate the diseases with which intestinal sarcoma is most likely to be confounded, omitting the very rare conditions, such as actinomycosis or echinococcus disease.

The main question that arises is, Can these tumors ever be positively diagnosed? Undoubtedly in many cases it would have been impossible to make the correct diagnosis. We believe, however, that in a certain number of instances the correct diagnosis can at least be strongly suspected. If there is a large movable tumor present, or, better, one large and several small tumors, or, if beside, growths can be felt by rectum, with but little or no ascites, and with early œdema of the legs, and the peculiar color described, the diagnosis of sarcoma of the mesentery or omentum is very probable. If these symptoms occur in a person under fifteen the diagnosis is still more probable. Having made a diagnosis of peritoneal sarcoma, and the tumor being movable, the existence of a primary intestinal sarcoma must be strongly suspected, and can be made positively if there exist early in the case intestinal disturbances, or if the colon bacillus can be isolated from effused fluid, if such be present (as in our fifth case). Of course we can never say positively that the tumor is not primary in the mesentery. However, as far as treatment is concerned, there is no importance in this distinction.

The following are the diseases to be differentiated :

1. *Carcinoma of the Intestine and Peritoneum.* Baltzer states that sarcoma occurs earlier in life, that carcinoma is apt to produce a stenosis earlier, is more tender, and lasts longer. Schmidt believes that œdema of the legs, with little or no ascites, would favor sarcoma. This latter statement is certainly true. Baltzer's remarks are, however, not absolutely correct. We shall later see that, although sarcoma is usually rapid in its course, it may be slow, and there are numerous instances in which carcinoma runs a rapid course. Again, we have shown that sarcoma does occur after the fortieth year, although not commonly. According to our personal experience, carcinoma of the intestine occurs quite frequently in people between the ages of fifteen and twenty-five. It is true that it then generally involves the cæcum, descending colon, or rectum, but if metastases are already present (and it is mainly under such conditions that the differential diagnosis must be considered) the cases might well be confused with sarcoma of the intestine. We will therefore modify Baltzer's statement, and say that under fifteen years of age the diagnosis would be decidedly in favor of sarcoma (although it is true that even congenital intestinal carcinoma has been described as well as congenital sarcoma), and that after the age of forty sarcoma is less probable but cannot be excluded. Important points against the

diagnosis of carcinoma are the absence of external glandular involvement, the absence of tenderness, and the large size of the growths in the sarcoma cases.

2. *Tubercular Peritonitis, and Tuberculosis of the Mesenteric Lymph Nodes.* The differential diagnosis may be very difficult, and even if a positive diagnosis of sarcoma is made the presence of a concomitant tuberculosis cannot be excluded. This was made especially clear in a case described by Nothnagel, in which his diagnosis wavered between these two conditions, and in which the autopsy revealed lymphosarcomatous growths, springing from the edges of cicatrizing tubercular ulcers. The presence of a very large tumor or tumors speaks more for sarcoma. The facies is different in the two conditions, but the recognition of this point requires much experience. Ascites is more apt to occur early in tuberculosis. A tubercular history is of no use in excluding sarcoma, nor is the existence of fever. If the ascitic fluid should reveal tubercle bacilli of course the diagnosis of at least a tubercular condition being present would be absolute.

3. *Intestinal obstruction, intussusception or intestinal perforation when due to sarcoma,* is accompanied by the same symptoms as under other conditions, and the diagnosis can be made only if the growths can be felt and if other symptoms are present.

4. *Sarcoma of the kidney* is not generally so mobile. Hæmaturia would speak decidedly for a renal growth, but this does not occur in the majority of cases. In renal sarcomata the tumor is generally located more on one side of the abdomen, but this may also occur in intestinal sarcoma. If nodules are felt elsewhere in the abdomen they speak for intestinal or mesenteric sarcoma, as the renal cases do not show metastases in the peritoneum. Further, the kidney sarcomata are less rapid in their course.

5. *Ovarian Tumors and Cysts.* A pedunculated intestinal growth may closely simulate an ovarian cyst, and, on the other hand, an ovarian tumor may be located in the upper part of the abdomen, and simulate a mesenteric or intestinal tumor. The finding of a pedicle (Hegar's method) springing from the uterus would make the diagnosis clear. In a case recently seen no pedicle was felt (Hegar's method not being tried), and as the tumor was surrounded by a group of distinct nodules the diagnosis of intestinal or mesenteric sarcoma seemed assured. The operation, however, revealed an endothelioma of the ovary, and what had appeared to be separate nodules were found to be large irregularities springing from the tumor.

6. *Neoplasms of the Bladder and Prostate Gland.* Given a large tumor in the region of the bladder or prostate, especially in a person under forty, it is necessary to determine whether or not the same is

due to a secondary growth from an intestinal sarcoma or is a primary intestinal growth which has become adherent in the pelvis. In two of our cases some of the symptoms might easily have been construed as indicating a primary growth of the bladder.

7. *Retroperitoneal Sarcoma.* The differential diagnosis may again be very difficult here, although unimportant, for an intestinal tumor extensive enough to resemble one of these retroperitoneal sarcomata is generally a non-operable case. We cannot enter into a description of these sarcomata here, but would refer to a review of the subject by Steele, in *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, March, 1900, page 322. He says that in retroperitoneal sarcoma the colon lies in front of the tumor, that obstruction of the intestine is apt to ensue, and that pain in the legs and in the lumbar regions is characteristic.

8. *Appendicitis with or without Peritonitis.* Our third and fourth cases show how closely this may be simulated by an intestinal sarcoma (and it is not difficult to appreciate how much greater this similarity might be in cases where the sarcoma is primary in the cæcum). The diagnosis will have to be made on the lines laid down until more cases are reported. I would lay great stress, however, on the attempt to find nodules by rectal examination. A single mass felt by the rectum is not of much use for differentiating the conditions, as such a finding is frequently enough made in appendicitis cases, and it not uncommonly occurs that a separate, very hard mass closely resembling a tumor may be felt by the rectum in cases of appendicitis.

9. *Differential Diagnosis Between Lymphosarcoma and Other Varieties of Sarcoma.* This cannot at present be made with any degree of certainty; all we can now say is that with spindle-celled sarcomata there is apt to be one large mass, whereas the lymphosarcoma cases usually present multiple growths.

EXPLORATORY LAPAROTOMY. We believe that this is indicated in all cases except in those in which there can be felt several distinct masses at some distance from each other. A large mass with nodules nearby may represent a solitary tumor only, as was demonstrated in the case of ovarian endothelioma cited above.

DURATION AND PROGNOSIS. Baltzer puts the duration at from two weeks to one and three-quarter years, most cases dying within nine months. This statement is corroborated by the cases since reported with the exception of a case described by Rutherford, which was of two and one-half years' duration. In our third case the history was only of one day's duration, but the statement made by the relatives that the patient had slight pains in the stomach for three months, although he continued at work, must be taken to indicate a longer existence of the illness.

The prognosis seems to be almost invariably fatal. A number of these cases have been operated on, and some, it is claimed, with a favorable result, but the ultimate outcome of the cases has not been given. In only one instance—a case reported by Babes and Nanu—was the patient alive after one year, and the authors themselves state that the ultimate outlook was bad. The other operated cases are as follows: Nicolaysen: spindle-celled sarcoma; recurrence in twenty-four days. Zuralski: cystic sarcoma; recovery for the time being. Lanne-longue: variety of tumor not given; ultimate result not stated. Heinze: resection of 110 cm. of the intestine with mesentery; recovery, but ultimate result not given. Among Baltzer's cases there are four in which death resulted within twenty-four hours after operation. Siegel has recently reported a case of lymphosarcoma for which he resected 30 cm. of small intestine, but death resulted within two weeks. Van Zwalenburg (verbal communication: case to be presented at the meeting of the American Medical Association, June, 1900) has operated on a case, the patient being alive now, seven months since the time of operation.

TREATMENT. (a) *Operative.* When the growth can be removed completely this should certainly be done; but we believe that cases of lymphosarcoma with extensive metastases should not even be subjected to exploratory incisions, as this is likely to hasten the occurrence of the fatal issue.

(b) *Medicinal.* In the literature there are a number of undoubted instances in which sarcomata, particularly lymphosarcomata, have been cured or improved by arsenic given internally, used hypodermatically, or parenchymatously (into lymph nodes). Such cases have been reported by Liebmman, von Ziemssen, Köbner, Billroth, Winiwarter, Tholen, Arning, and Wunderlich. In their cases there was generally present a multiple lymphosarcomatosis, or sarcoma of the skin. We believe that this treatment should invariably be tried in cases of intestinal sarcoma, and that it should be used also for the patients upon whom successful resections have been performed. Whether Coley's fluid would be of any value in these cases future experience alone can decide. The remainder of the treatment is purely symptomatic.

ADDENDA. Since writing the above my attention has been drawn to an interesting case reported by Lindner in the *Beiträge zur klin. Chirurgie*, 1899. This case was that of a man, aged thirty-six years, who six months before he came under observation was operated upon for a supposed carcinomatous ulcer of the head, and who for fourteen days was suffering from symptoms of ileus. There were present a marked enlargement of the lymph nodes on one side of the neck and a tumor in the right hypochondrium. At the operation an intussus-

ception of the small intestine was found, and the gut was full of lymphosarcomatous tumors. A resection was done, but the patient died after twenty-four days. Lindner believes that the tumor was primary in the intestine, and that the ulcer on the head, which had been supposed to be carcinomatous, was probably sarcomatous. He reports the case as an instance of a tumor whose metastases caused symptoms long before the primary growth was revealed, but does not state how long the tumors were present in the neck.

A case of intestinal sarcoma was reported to the Surgical Section of the New York Academy of Medicine by Dr. Weir, on May 14, 1900, for which he resected eight feet of small intestine. The patient lived for two days. Dr. Weir kindly allowed me to refer to this case before its publication in the Society reports.

Two further cases of lymphosarcoma occurred in the hospital in June, 1900.

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REVIEWS.

COLUMBIA UNIVERSITY BIOLOGICAL SERIES. Vol. IV. "The Cell in Development and Inheritance." By EDMUND B. WILSON. Second edition, revised and enlarged. New York and London: The Macmillan Co., 1900. Pp. xxi., 483, with 194 figures in the text.

THE importance of the cell theory in the medical sciences has been generally recognized since the appearance of Virchow's *Cellularpathologie* in 1858. Strange to say, however, medical men have paid extremely little attention to the cellular phenomena until within the last few years, and even now such attention is confined almost exclusively to certain cellular aspects of pathology. In this country, at least, medical education takes almost no account of the normal structure and functions of cells, and yet upon this very basis must rest any thoroughgoing knowledge of the animal body in health and disease. Verworn and Loeb have called attention to the necessity of a knowledge of cellular or general physiology if one is to arrive at any understanding of the fundamental properties of living things, and a similar claim may be made for cellular morphology. In fact, the cell theory of Schleiden and Schwann occupies a position in biology to-day second only to the evolution theory, and in some respects the former is even more fundamental than the latter, since the whole problem as to the mechanism and causes of evolution, inheritance, variation, assimilation, metabolism and irritability can be approached only from the stand-point of the cells.

To be sure, it is not absolutely essential that a physician should be trained in cytology in order to make diagnoses and write prescriptions. The structure or functions of nucleus or cytoplasm are of small concern to the man who is primarily interested in the art of applying to the recognition and cure of disease those principles which are already well established. On the other hand, a knowledge of cytology is indispensable to the medical man who is striving to extend the bounds of his science, and the history of medicine no less than the whole history of human advancement serves to show that no knowledge of fundamental phenomena is useless or without consequence.

The greatest danger in all recent scientific work is the outgrowth of the very principle which has made science most effective, viz., *specialization*. So great are the number of workers, and so rapid is the advance in every science, that it has become impossible for any one man to follow the whole advance of his own science. Louis Agassiz used to say that he pitied the man who would undertake to keep track of zoölogical literature fifty years after his day. There are few if any such men to-day either in zoölogy, botany, physiology, pathology or related sciences. Men are no longer naturalists, but helminthologists, ophthalmologists, cytologists, etc., and while the result of this specialization

has been such a rapid advance in the knowledge of individual facts as the world has not known before, it has failed to bring forth any such great principles as date from such old masters as Joh. Müller, Virchow, Sachs and Darwin.

There is no greater need in modern scientific work than facilities by which workers in any branch of science may in the briefest possible way become acquainted with the general stand of sciences other than their own. This is met to a certain extent by the many excellent *Berichte* and indices which summarize the work of each year in the various sciences; but even these are too extensive and technical for persons outside the particular science in question. Every few years there is need of some general work in each science which shall give in accurate and yet in generally intelligible form the present stand of that science. Fortunately this need is being met by the publication by eminent authorities of text- and reference-books in the various sciences. It is a pleasure to note that in this work, which is often burdensome and thankless, some of the greatest living authorities are engaged.

Professor Wilson's book on the cell, the second edition of which has just appeared, is a work of more than ordinary interest, not only to the cytologist, but to all persons who are interested in any of the biological sciences. It is not the first book in this field, though I think it may be said to be easily the best. Herwig's splendid treatise (*Die Zelle und die Gewebe*, 1893) was really the first general work in the field. Since then have appeared Henneguy's *Leçons sur le Cellule* (1896) and Häcker's *Praxis und Theorie der Zelle- und Befruchtungs Lehre* (1899). Wilson's work is limited, as, indeed, also is Henneguy's and Häcker's, to those cellular phenomena connected with development and inheritance in which at present knowledge is most advanced and interest most intense.

After an extremely suggestive introduction, in which the history of the cell theory and its relation to the evolution theory is discussed, the author, in successive chapters, treats of (1) cell structure, (2) cell division, (3) the germ cells, (4) fertilization, (5) chromatic reduction, (6) cell organization, (7) cell chemistry and cell physiology, (8) cell division and development, (9) theories of inheritance and development, while an excellent glossary, a general literature list and indices of authors and subjects are found at the close of the volume.

To those who are unacquainted with the recent developments of cytology some idea of the extent of work in this field will be conveyed by the statement that 820 papers are cited in this book, most of which have appeared during the past ten years. Almost every topic is taken up from the historical point of view, the present stand of the subject is then presented, followed by a discussion of the problems connected with it which are still unsettled. The whole of this is done with the accuracy and thoroughness of a piece of research; in fact, the work is in many ways a most important contribution to knowledge. For all this, it will prove none the less interesting and intelligible to the general reader who may be unacquainted with the recent developments of the cell theory.

The book is written in a lucid, almost picturesque style, and is so profusely and beautifully illustrated that it will certainly appeal to the general scientific public as well as to those who are more directly concerned with the subjects treated.

E. G. C.

THE PRINCIPLES OF TREATMENT AND THEIR APPLICATION IN PRACTICAL MEDICINE. By J. MITCHELL BRUCE, M.A., M.D., F.R.C.P. Adapted to the United States Pharmacopœia by E. QUIN THORNTON, M.D. Philadelphia and New York: Lea Brothers & Co., 1900.

ONE can but wish that a healthy cynic with a sharp wit might brave criticism to-day, as Oliver Wendell Holmes did forty years ago in his "Currents and Counter Currents of Medical Science." He might force upon an unwilling band of empirical therapeutists the conviction that they do not differ widely from those whose teachings are so bitterly scorned, the pupils of him who taught that the itch was all-prevalent, and was to be cured only by taking a minute dose of the hair of the miserable canine that caused the affliction. It is true that the American eagle cannot scream so joyously to-day because of enormous doses, and that forty years ago the stars and stripes could wave more proudly—for three drachms of calomel are rarely given now at a single dose. But while heavy volleys are not often discharged at unfortunate patients, random shots come from many directions, fired with blind trust that they may hit something, since someone else, though he knows not why, has said that he has struck the mark.

The earnest work that has been done on the physiological action of drugs and the wonderful glimpses of rational treatment of infections that the bacteriologists have given us have driven blind empiricism into the background in the minds of thoughtful men, but the activity of those who have interests in proprietary preparations unites with the common eagerness for something new, and the two engulf us in a literature on drugs that is filled with contradictions and counter-assertions based almost exclusively upon the observation of symptoms, while the nature of the disease, its etiology, and its natural course receive little or no consideration. A warm welcome must await all works that meet this current and turn it backward, and Dr. Bruce has met it boldly with pathology as his strong mainstay.

The first part of the book may at first prove disappointing to those whose chief object in reading a work on therapeutics is to learn of new drugs which they may use in the chance of doing some good; but it is this part of the work that is most welcome of all. It meets the subject of therapeutics from a very unusual stand-point—264 pages are devoted to purely general philosophical considerations. The indications for treatment which may be gained from a study of the etiology of diseases are pointed out, and this is followed by a similar consideration of pathological indications, then by a discussion of clinical indications, and this by a valuable chapter on personal factors in their relation to disease. The latter part of this section deals with the question of the need or lack of need of interference in disease, and with the discussion of general means of treatment—food, rest, exercise, nervous influences, and the like. The section is closed with a discussion of the art of rational treatment in theory and in practice, and with a careful consideration of the proper mode of procedure in treating a case. A few of the statements in this last chapter may well be referred to: The first indication is to make a diagnosis of *the case* as distinguished from the disease, and to be prepared to treat *the patient*. After making a diagnosis, consider the course which the disease is likely to follow, review deliberately the etiological, pathological and clinical facts of the case, and determine the indications

furnished thereby. After this, one should consider the order in which the indications should be attended to; and we may see, as a guiding star, the italicized statement, "*let well alone.*" The final indication is to prescribe remedies only in a methodical way and with a definite purpose.

This part of the book does not consider the use of individual drugs for special purposes, and to some readers there may seem to be more words than practice in it; but if it were read by medical students before beginning their course in therapeutics, and by many practising physicians, they would be saved from the danger of falling into the slough of profitless empiricism.

The second portion is one of the most rational and practical discussions of the treatment of special diseases in existence, and evidences in all parts the experience of a thoughtful man. The treatment of various diseases is taken up first from the point of etiology and prophylaxis, next in relation to the indications furnished by the pathological alterations probably present, and after this the clinical phenomena are considered in connection with the treatment indicated. All these matters are gone over in their relation to the attendant's first visit. The author then discusses the course which the disease is likely to follow and the indications that may be met with at various periods of its progress. Complications and their management are considered, and treatment during convalescence receives a good deal of space. Finally, at the end of the section on each disease there is given a summary of the management of the case from the beginning to the end, which puts the whole matter at the service of even the busiest man. There are innumerable useful suggestions in this portion of the book. As an example may be mentioned the fact that Dr. Bruce devotes some time to the question as to what life work may be recommended for boys who have acquired heart disease in early life. Other similarly practical points are met with throughout this portion.

In parts the style is somewhat fanciful, as, for instance, in the first half, the description of the battle array of the phagocytes when they advance to meet the micro-organisms of disease, and their retreat when the enemy is present in too great strength; but this adds charm, even though it occasionally sacrifices a little scientific exactness. At times there is perhaps too much attention given to facts which are almost self-evident, but excessive space is only rarely used, and, as a rule, each page may be read with profit.

D. L. E.

THE ANATOMY OF THE BRAIN. By RICHARD H. WHITEHEAD, M.D.
New York, Chicago, Philadelphia: The F. A. Davis Company, 1900.

AMERICAN anatomists, after waiting many years, seem to have become impressed with the idea that works on the anatomy of the nervous system are sadly needed. We had Gordinier's book, later Barker's more extensive work, and now the little volume by Whitehead appears. The last makes few claims. It has been written in the hope of giving to the student an introduction into the mysteries of the structure of the

central nervous system. It is not intended for the trained anatomist. It fulfils its object, provided the student will read it in connection with a dissection of the human brain and an examination of microscopical serial sections, made by himself, if possible; otherwise he will have very confused ideas of what he has studied. Throughout the work the author uses the Latin terms recommended by the German Anatomical Society in connection with those more commonly employed. The statements are sometimes made with a positiveness that may lead the student to believe that no other views than those set forth in this work are held by reliable anatomists. This fault is difficult to avoid, and yet we think that debatable statements should be presented with an acknowledgment of uncertainty.

The first part of the book is devoted to the gross anatomy; the second to the microscopical anatomy, and in the latter more opportunity for a difference of opinion is afforded. Whitehead speaks of the "spinal tract of the trigeminal nerve." Some German anatomists, while acknowledging that this is a correct designation, occasionally refer to the "ascending root" of the fifth nerve, and the student must add to his burdens the knowledge that this "ascending root" is really descending. Whitehead unfortunately calls the mesencephalic root of the fifth nerve the "descending root." As the spinal root is also descending, we must employ either "cerebral" or "mesencephalic" for the superior root. In several places Whitehead speaks of "olive," but as we have a superior, an inferior and accessory olives, each should be properly designated, especially as this book is for students who are not very familiar with the microscopical anatomy of the nervous system. He also speaks of the olive as showing three pieces. Does this mean that the accessory olives are part of the lower olive? He follows the views of many when he says that the dorsal nucleus of the tenth nerve is sensory. This nucleus has been shown by van Gehuchten to contain cells whose axones pass to the periphery of the medulla oblongata, and this, together with other recent evidence, permits us to regard this dorsal nucleus as motor. Whitehead devotes only a few words to the division of the fibres in the cerebral peduncle, and in this way avoids the disputes that have arisen in regard to the crura. The region of the hypothalamus, so difficult to understand, receives little attention, and possibly the student will be thankful for this. We may question the statement that the corpus callosum connects corresponding parts of the two cerebral hemispheres, if by this is meant that it connects only corresponding parts, as the words imply. The description of the caudate nucleus as a gourd-shaped mass is excellent, provided the student has in mind the right kind of gourd. Each half of the body is represented in the cortex of the opposite hemisphere, as Whitehead says, but it is also partially represented in the cortex of the same hemisphere. Anatomical findings and clinical phenomena force this view upon us. The upper and anterior part of the parietal lobe should also be included in the motor area. Whitehead believes that the majority of fibres of the median lemniscus terminate in the optic thalamus; he has many to support him in this view.

It is possible to pick out here and there other slight inaccuracies and debatable statements, but this is not an agreeable task, and gives an unfair impression of the value of the book. One is reminded by Whitehead's book of the early editions of Edinger's lectures, and yet

the two works are very differently constructed. Whitehead's little book may be recommended to the student, but he must not imagine after reading it that he understands all the microscopical anatomy of the central nervous system. He will have, however, a fair knowledge of this anatomy, and will be less liable to make the wild guesses too often indulged in by some who attempt cerebral and spinal localization with little knowledge of the relation of the parts. W. G. S.

DISEASES OF WOMEN. A Treatise on the Principles and Practice of Gynecology. For Students and Practitioners. By E. C. DUDLEY, A.M., M.D., Professor of Gynecology, Northwestern University Medical School; Gynecologist to St. Luke's Hospital, Chicago, etc. Second edition, revised and enlarged. With 453 illustrations, of which 47 are in colors and 8 full-page plates in colors and monochrome. Pp. 717. Philadelphia and New York: Lea Brothers & Co.

OUR prediction with regard to the reception which would be accorded to this admirable work has been verified, as shown by the appearance of a second edition in a little over a year. Although the short time which has elapsed since the appearance of the first edition naturally does not permit the introduction of many new facts, the book has been carefully revised, several chapters and illustrations have been added, and considerable new matter has been interpolated. The most striking feature, "the grouping of subjects, not by the more common regional method, but, so far as possible, from the stand-point of pathological and etiological sequence," has certainly commended itself to medical teachers and students.

Although the former edition was exhaustively reviewed in the JOURNAL, it may not be amiss to call attention again to the salient points of this successful work, which represents the mature experience of one of the ablest of the circle of gynecologists who have sat at the feet of Dr. Emmet. In this iconoclastic age it is characteristic of the author that he has never swerved in his loyalty to his old teacher. The criticism has been made that this attempt to reconcile early teaching with facts established by more modern pathology has in some instances led to embarrassment, especially in the chapter on pelvic cellulitis. Again, the objection has been raised that more attention has been paid to the subject of laceration of the cervix than would seem to be justified in view of the diminished importance now attached to this lesion by many gynecologists. Yet, to be consistent, the author could not have taken a different position with regard to these questions, and since he has shown that he is an original thinker, as well as a loyal follower of his honored leader, he should not be harshly criticised. A second reading of the introductory chapters confirms us in our opinion that they are full of practical hints and timely suggestions. The sections on operative technique are not, as is often the case, mere compilations, but represent the experience of a careful and resourceful surgeon.

In reviewing Part II., on infections and inflammations, we are again

struck with the happy way in which the unities are preserved. This is not a new plan, since it has been followed in some foreign works on gynecology, but it has not been so skilfully elaborated in any previous American text-book. Whether the difficult subject of inflammation of the uterus has been made clear to the beginner or not is a question. Personally, we have found that the term "chronic metritis" (or "chronic myometritis," as the writer prefers to call it) is often a serious stumbling-block to the student. We hope some day to see both chronic endometritis and metritis described as end-processes rather than as true inflammatory conditions; indeed, we are sufficiently radical to believe that the expression "chronic inflammation" may eventually disappear from our text-books.

We note that in Part III. tumors, tubal pregnancy and malformations are grouped together, although the connection is not clear. We venture the criticism that the union is an artificial one and that Chapters XXXVI. and XXXVII. would appear to better advantage, the former under the head of inflammation of the tubes (which is practically the etiological factor in tubal gestation), and the latter either at the beginning or at the end of the book.

In Part IV. the author is clearly at home. The description of the various plastic operations on the pelvic floor, cervix and urinary tract show the hand of a master. It is no disparagement to the originator of the operation for repair of the lacerated cervix to say that not even in his own book is the subject so lucidly discussed.

The sequence between traumatisms and displacements is entirely logical. The latter subject is presented most attractively, and will be especially appreciated by the student. The text and illustrations bearing on the author's operation make this ingenious and useful procedure almost as clear as a demonstration on a living subject. We commend pages 632-638 as a good specimen of Dr. Dudley's terse, lucid style. He handles the pen, as he does the scalpel, without any uncertainty as to the end to be attained.

Apropos of the chapter on massage, we question if this method of treatment will ever become popular in this country, or if it should be taught to students. An expert may clearly recognize the contraindications, but no other should attempt the delicate manipulation necessary to free imprisoned adnexa. When, after the lapse of another year, a third edition may, as we trust, be necessary, the author may decide that Part VI. as it now stands does not add to the strength of the book. Indeed, he states in a footnote that it is to be regarded rather as an appendix than as an integral part of the work.

We may have assumed the somewhat ungracious rôle of a critic of the second edition after the unqualified praise which was bestowed upon the first. But the work is so strong in almost all points that we wish it to be made better still, and we feel sure that in subsequent editions certain minor blemishes will disappear and the future critical reader will gladly place *Dudley's Gynecology*, as we do now, side by side with the classical work of his honored teacher.

H. C. C.

THE AMERICAN YEAR-BOOK OF MEDICINE AND SURGERY. Being a Yearly Digest of Scientific Progress and Authoritative Opinion in all Branches of Medicine and Surgery, drawn from Journals, Monographs, and Text-Books of the Leading American and Foreign Authors and Investigators. Under the general editorial charge of GEORGE M. GOULD, M.D. Philadelphia: W. B. Saunders, 1900.

THIS year this valuable publication has been rendered more convenient by dividing it into two volumes. There are a few changes in the names of the contributors, but none in the quality of the articles, excepting possibly a slight improvement. In considering this work as it appears from year to year the most striking feature is the small number of really important articles that are contributed annually to medical literature. This is particularly impressive when one realizes the immense number of articles that have been abstracted in order to fill the two volumes. For example, there are considerably over a thousand abstracts in the section on general medicine, very nearly as many in the section on surgery, and altogether we should estimate the total number at approximately five thousand. Nevertheless, it is difficult to select one hundred of these that are likely to be read ten years hence, excepting by those interested in the literature of some special subject. In fact, upon consideration, we think it doubtful if there will be more than ten such—that is, one-fifth of one per cent. It is not to be supposed, however, that because an article becomes worthless in a few years it is necessarily worthless at the present time. If a physician has the good fortune to produce something of lasting value, that is no reason why another who makes a contribution merely to statistics, or simply repeats, to perhaps a different audience, information already more or less well known, has not fulfilled a worthy purpose.

In looking over the book we note in the section on medicine the great number of articles upon typhoid fever. Among the most interesting is one of Stahl's, who describes a curious form of gangrene of the skin that he observed in 10 of 144 cases. There is considerable discussion of the possibility of combined infection of malaria and typhoid, and a number of interesting cases are reported by various authors. Practically, nothing is added to the treatment of typhoid fever. In regard to malaria, there is a moderate amount of literature upon the etiological rôle played by the mosquito. This literature has, since the abstracts closed, been considerably increased, and some of it that had, been published in the *Centralblatt für Bakteriologie*, etc., evidently escaped the attention of the contributors. Almost no notice is taken of the vigorous warfare that has been waged regarding the relation of the bacillus *icteroides* to yellow fever. Tuberculosis, as usual, occupies considerable space; but the only really important article is that by Hauser, who has made a careful statistical and experimental study of the transmissibility of the disease from the parent to the offspring. Considerable work has been done upon the blood, among the interesting articles being one by Löwit upon leukæmia, which he believes is due to an amoeba circulating in the blood. Of course, the proof he furnishes is not at present satisfactory. But little that is of remarkable interest has been added to the diseases of the thoracic organs, and the pathology of the stomach has not yet apparently been crystallized into a definite and satisfactory system. Adami believes that cirrhosis of the liver is due to infection by

micro-organisms that ordinarily are killed by healthy tissues. In the section on pediatrics considerable space is devoted to infant feeding, and there is an excellent plate of Koplik's spots on the mucous membranes in measles. One of the most notable articles that is abstracted is that of Birch-Hirschfeld upon the primary seat of tuberculosis in the lungs. Otherwise but little has been added to the subject of pathology in the past year, although Mallory has studied typhoid fever and Streckeisen the fragmentation of heart muscle. The subject of tumors has had barely two and-a-half pages allotted to it. In the section on nervous and mental disease a considerable amount of space is devoted to Collier's article on Babinsky's sign, which has recently attracted wide attention on account of the publications of Walton and others in this country. Some of the articles in this section apparently belong elsewhere, as, for instance, the article of Kuperwasser on the blood in syphilis. The *Archiv für Psychiatrie* appears again to have been neglected. We prefer the term *paralysis agitans* to Parkinson's disease, although in this article the latter is given in preference. Considerable space is devoted to the subject of Finsen's phototherapy in the section on skin diseases; without expressing a positive opinion the editors remark that it is well worthy of further study. In the section on materia medica there is a long discussion upon the results obtained from the antitoxic serums, particularly the antistreptococcic serum. The evidence on this subject is still so contradictory that it is impossible to arrive at any positive conclusion. A good deal of space is also devoted to suprarenal extract, which appears to have proven its value. Necessarily less space has been devoted to the scientific subjects, but we mention with cordial approval the excellent section on physiological chemistry by Jones and Hunt.

The second volume is devoted to surgical conditions and to the specialties more or less akin to them. Improvement appears to have taken place in antiseptic technique, as, for example, by the use of rubber gloves. The study of tumors and cysts, both from an operative and pathological stand-point, is excellent, while the space devoted to diseases of the œsophagus, stomach, peritoneum, and intestines is an evidence of the advances in the surgery of these organs. The literature on X-rays has diminished considerably; on the contrary, the literature of bullet wounds has been somewhat increased as the result of the recent elaborate experiments that have been carried out by various nations in the pursuit of warfare. Kelly's operation of perineorrhaphy is liberally illustrated. The section on anatomy is unusually brief. Wyatt Johnson's article deserves especial praise.

Taking it as a whole, the book fully deserves all the commendation that can be bestowed upon it. It gives a very thorough review of the literature for the period it covers, and is invaluable for the purpose of getting on the track of literature, particularly in reference to obscure cases.

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PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

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Aspiration of the Lung in the Diagnosis of Tuberculosis.—The diagnosis of pulmonary tuberculosis before bacilli appear in the sputum is becoming daily more important in practical medicine, since abundant experience shows that the diagnosis can sometimes be made with great certainty before there is sputum, and the X-ray apparatus and tuberculin test are neither always reliable nor always at hand. HENKEL (*Münchener medicinische Wochenschrift*, March 27, 1900) calls attention to the advantage of diagnostic puncture in such cases. The operation is done with strict aseptic precautions. The skin is washed with spirit of soap and ether, shaved, if necessary, the syringe is boiled, the hands are sterilized. Aspiration is made slowly and with short interruptions. The sputum after the operation is occasionally blood-stained, but actual hemorrhages have not been observed. At times there is a slight temporary rise of temperature. The author has never seen any injurious effects, but reserves the operation to the cases in which a positive diagnosis of the existing pulmonary disease cannot otherwise be made. The operation is useful in cases of pneumonia with delayed resolution, and cases of local bronchitis without sputum or without bacilli in the sputum. The puncture should be made where the physical signs are most distinct. Occasional assistance may be derived from the feeling of resistance of the lungs, especially when pleural thickening can be excluded.

Kinds of Gastric Secretion and their Anomalies.—A. SCHIFF (*Archiv für Verdauungskrankheiten*, Bd. vi. p. 107) has made an extensive series of examinations showing the relations of the different gastric secretions to each other in health and disease, and confirming on the whole what previous observers have found regarding the independence of these functions. The

most resistant function is that which produces the diluting fluid. This is frequently present when the secretion of HCl and pepsin are entirely absent, as in many cases of achylia. In animal experiments this secretion can be excited independently of the others, and under the action of pilocarpine it appears earlier and in greater extent than the other secretions. The gastric juice produced by pilocarpine injections is, as a rule, of relatively low acidity, but, as in one of the author's experiments, may contain no free HCl. Next to the water secretion, pepsin is most readily produced. Both pepsin and water are absent only in cases of total atrophy of the mucosa and in many cases of achylia gastrica simplex. In some cases of achylia gastrica pepsin may be absent, though water is still secreted in the stomach. Secretion of pepsin is very constant and easily excited. In the majority of cases of hypochlorhydria and anachlorhydria as long as the mucosa is not destroyed pepsin may be normal, and pilocarpine injections produce a gastric juice at least as strong in pepsin as normal. The secretion of pepsin occurs readily, because the substance is already present in the glandular cells and seems to depend essentially on the energy of the current of gastric juice. The relatively equal amounts of pepsin under the influence of atropine and pilocarpine and in the normal secretion confirms this view. The most difficult function of the gastric glands is that of HCl secretion. The excitation has to bring about not only secretion, but also the production of a substance not preformed, by overcoming chemical affinities. The HCl secretion is the most sensitive function of the gastric glands. It is not only diminished, but often absent in many pathological cases where the pepsin and water are still present, and it can be diminished or checked by lowering the nervous excitability, as by atropine; although here, too, pepsin and water are diminished little or not at all. On the contrary, the increase of HCl secretion cannot be brought about by pilocarpine.

The Recognition and Importance of Bilirubin in the Stools.—SCHOR-LEMMER (*Münchener medicinische Wochenschrift*, 1900, No. 14) has investigated the bile-coloring matter in the stools, with the result that he entirely rejects Gmelin's test, because it frequently gives a positive reaction when bilirubin is not present. He uses Schmidt's test, carried out as follows: 2 to 3 c.cm. of the fresh fecal matter are rubbed up with concentrated watery sublimate solution. The mixture is allowed to stand in a covered glass dish, and then examined macroscopically and microscopically for green particles. The reaction is reliable, because the oxidation of the bilirubin never goes beyond the stage of biliverdin. The only confusion possible is by vegetable remains containing chlorophyll, which, however, are easy to recognize as such. All substances containing hydrobilirubin are stained red, giving the test another advantage. Examinations with this test led the author to conclusions rather different from some that have been handed down from previous observers, though he confirmed the generally accepted fact that in normal feces bilirubin is always absent. In a number of cases of disease of the stomach with normal stools, bilirubin was always absent, or occurred only in vegetable tissue and microscopic amorphous masses, apparently of soap. In cases of intestinal disease bilirubin was absent in only 4 cases out of 42. In most cases the test was microscopical only, but in 4 cases of acute

enteritis and 2 of colitis, the macroscopic test was positive. The author's results show that in contradiction to previous views bilirubin may appear in the stools in diseases of the colon, as well as in that of the small intestine. Schorlemmer also has examined the particles of so-called yellow mucus supposed by some to indicate inflammation of the small intestine. He believes that these bodies are really albuminous. On the contrary, he finds, as Schmidt did, that small particles of mucus, often containing micro-organisms and granular débris of various kinds, frequently appear in the stools in disease of the small intestine, especially in typhoid fever, though he would only use them for the local diagnosis when there are at the same time numerous fragments of muscle fibre, starch granules, and fermentation.

Diabetic Laryngitis.—The late OTTO LICHTENSTERN (*Münchener medizinische Wochenschrift*, 1900, Nos. 16 and 17) describes this rare complication of the larynx in diabetes. It comes on as an acute circumscribed œdema, rapidly passing on to abscess. The process recurs in different parts of the larynx, especially in the region of the summits and posterior surfaces of the arytenoids, including the mesoarytenoid fold and the hypoglottic region. The abscess usually heals rapidly after it is opened, although the author observed in one case of hypoglottic abscess an abscess on the anterior wall of the larynx. There is no fever, and the general symptoms are mild. The author admits the possibility of the process occasionally becoming more serious, and compares it in this respect with disease of the lungs in diabetes. In regard to the cause, the author looks on overexertion of the vocal organs as a predisposing one. Bacteriological examinations could not be made, but the author admits that bacteria are most probably the exciting cause. He suggests, however, that possibly a toxic product of the diabetes may be the real cause.

The Differences between the Temperature of the Rectum and Axilla, Especially in Appendicitis.—SCHUELE (*Münchener medizinische Wochenschrift*, 1900, No. 18) has made a number of observations showing the relations of the axillary and rectal temperature. He found that this varies between 0.1° and 1.5° C. In two cases there was no difference. Some of the persons examined seemed inclined to slight differences; others to relatively great ones. The cause of the greater differences seem to be due to a relatively low temperature of the axilla. In afebrile persons the axillary temperature never exceeded 37.2°. The average of 162 measurements on 16 afebrile persons was 0.6° C. The difference in fever was usually less, *i. e.*, 0.4° C. In one case of appendicitis with abscess into the bowel, the difference varied from 1.1° to 1.4° during the development of the abscess. The author looks on this as perhaps of diagnostic value in suspected inflammation in the pelvis. This idea had previously been entertained by Lenander and Madelung, though Lenander found many cases of beginning abscess-formation with relatively small differences.

Acute Infectious Poliomyelitis Anterior in the Adult.—GUMPERTZ (*Berliner klinische Wochenschrift*, 1900, No. 16) adds to the small number of cases of this kind the following: A robust merchant, of twenty-three years,

was taken sick for a few days with nausea, loss of appetite, lassitude, and fever. Four days after resuming work he became paralyzed. Examined soon after he was found free from cerebral symptoms, the left arm was paralyzed, the left leg was paretic, the muscles of the thigh relaxed, those of the leg slightly contracted. In the left buttock, near the spinal column, was a large furuncle. The knee-jerk was absent on the left side; normal on the right. The left deltoid muscle did not respond to the faradic current, sensibility was not impaired. The patient was treated with galvanization of the cord and galvano-massage of the paralyzed muscles. The paralysis gradually improved so that the patient could climb stairs, but easily became fatigued. There was atrophy and reaction of degeneration of the left deltoid muscle, but the biceps reacted almost normally. The absence of sensory disturbance, of pain, or increased galvanic irritability, and the fact that the paralysis was most marked in the beginning, excludes multiple neuritis. The sudden appearance of the symptoms and their extent excludes hemorrhage, so that acute anterior poliomyelitis of the rare hemiplegic form seems the only explanation. The author looks on the cause as an infection, probably typhoid. His suggestion that bacilli passed from the furuncle to the corresponding side of the cord is very plausible, but inasmuch as he also states that another abscess occurred on the opposite side, and as no observations were made of the bacteria in the abscess, some other explanation of the unusual localization of the disease must be admitted as possible.

A Study of Twenty four Cases of Typhoid Fever with Symptoms of Peritoneal Infection; Laparotomy.—GEO. B. SHATTUCK, J. COLLINS WARREN, and FARRAR (*Boston Medical and Surgical Journal*, June 28, 1900, p. 677) have published a most interesting report on twenty-four cases of typhoid fever in which there were symptoms of peritoneal infection, for which exploratory laparotomies were performed. They report in all on twenty-seven cases, but in three the proof of a typhoid infection was not sufficiently strong to include them. These cases were under treatment in four of the Boston hospitals since 1895.

Out of the twenty-four cases of true typhoid, only seventeen were cases of peritoneal infection from actual perforation of the intestinal wall. In two cases there was a general infection from threatened perforations or areas of necrotic peritoneum; in one case a general infection from a ruptured mesenteric gland; in one case a general infection from an unknown cause, presumably intestinal perforation; in three cases there was no certain cause for the symptoms which demanded operative interference. In other words, there were twenty-one cases of grave peritoneal infection in typhoid fever and three cases of mistaken diagnosis, but with symptoms of peritoneal infection.

Eighteen of the twenty-four cases were males and six were females. In eighteen of the twenty-four cases the clinical nature and course of the typhoid were mild, and in fifteen of these eighteen mild cases perforation or general septic peritonitis was present. These data show, as has been generally held, that there is no relation between the severity of the course of the fever and the likelihood of intestinal perforation.

In five cases the acute abdominal symptoms appeared at the end of the second or first of the third week, in eight cases at the end of the third week,

in one case during the fourth week, in four cases during the fifth week, in one case during the ninth week, in one case during the eleventh week in a relapse.

Seven cases of the twenty-one in which operation found cause for the symptoms presented a sudden acute picture of grave abdominal infection without any premonitory symptoms. In fourteen there was a more or less gradual onset of the abdominal symptoms, or at least distinct warning symptoms which antedated the equally distinct severe and diagnostic symptoms.

In the seven cases with no warning symptoms operation was done within twelve hours in every case. In the fourteen cases in which there were warning symptoms the average time of the operation, after the onset of the early warning symptoms, was twenty-three hours.

Of the twenty-one cases in which the local or general peritoneal infection was found at operation, three cases recovered—that is, 14.3 per cent. Taking their twenty-four cases of typhoid fever which were operated on, twenty-one with abdominal infection and three with no infection found at operation, they had six cases of recovery from laparotomy in typhoid fever, or 25 per cent.

Concerning the question of diagnosis, the fact that these writers had diagnosed general peritonitis in three cases without any peritonitis being found at operation is further proof of the great difficulty of making a diagnosis of peritonitis in some cases.

With regard to the study of the leucocytes in their cases, they say that they are not able to establish anything new and valuable in regard to leucocytes as a symptom, owing to lack of sufficient data. Their one conclusion is that the leucocyte counts in typhoid cases should be sufficiently frequent to be of comparative value; that any complaint of abdominal pain or the appearance of abdominal symptoms demand frequent counts.

From an analysis of their series of cases the writers conclude that:

(1) In many very sick typhoids perforation or peritoneal infection cannot be diagnosed until the results are already wide-spread and of fatal extent. The chances of a fatal issue from an abdominal operation in such cases are overwhelming.

(2) In mild typhoids of fair general condition an abdominal operation is readily borne, provided no peritoneal infection is present.

(3) A small number of mild typhoids may have sudden perforation with free extravasation. In these the symptoms are fulminant, but localized to a great extent, and in these

(4) Operation must be done at once, for general infection may become past relief in from one to five hours, and walling off of the perforation by protecting adhesions is so rare as not to be counted upon.

(5) In the majority of mild cases, beginning infection (whether from perforation or not) is marked by comparatively slight symptoms—local pain, tenderness, spasm, and leucocytosis. The severe subsequent symptoms were due to general peritonitis.

(6) These warning symptoms demand serious consideration and study, but in many cases are either not rightly understood or not acted upon.

(7) Complaint of abdominal pain in a case of typhoid should always lead to a suspicion of beginning peritoneal infection.

(8) Frequent leucocyte counts are needed in every case of typhoid. In the presence of abdominal pain an hourly count is necessary.

(9) Pain associated with local tenderness and muscular spasm and a rising white blood count points in most cases to the advisability of an operation; in all cases to the necessity for a surgical consultation.

(10) In not a few of this series of cases operation was imperative a varying number of hours before it was done.

If it can be appreciated that the severe symptoms more often mean general peritonitis, it must be understood that the milder and earlier symptoms are the important ones.

Typhoid Fever in an Infant Nine Months Old; Recovery.—During the past five years there has been considerable controversy among physicians especially interested in diseases of children regarding the frequency of typhoid fever in infants under two years of age. NORTHROP (*Presbyterian Hospital Reports*, New York, 1900, vol. iv. p. 74) held that the disease was rare in infants. He advanced the thesis that "typhoid fever is a disease to which there is little susceptibility in children under two years of age. In epidemics children under two years of age, though naturally little susceptible, may, in the presence of an overwhelming poison (multiplied exposures), acquire typhoid fever." This view was strongly assailed by nearly all the Pediatric Society, but was supported by Rotch and Holt. Lovet Morse, of Boston, is also led to support this view as a result of his experience with the Widal test in continued fevers of doubtful origin in infants coming to the dispensary in Boston.

In the extensive epidemic of typhoid fever in Stamford, Conn., there were four cases under two years of age, one of which terminated fatally.

Northrup himself reports an undoubted case in a female infant of nine months. The child had been breast-fed, but there were five other members of the family down with typhoid fever, and she had been crawling about the bed of her father, ill in his second week, and that of a brother who had been ill for seven weeks.

The diagnosis in this case was made on the continued fever, enlarged, palpable spleen, rose-spots, and two positive Widal tests.

Northrup personally has seen six cases of undoubted typhoid fever in patients of two years and under, viz.: nine, thirteen, sixteen, twenty-two, and twenty-four months of age, and draws the following conclusions:

(1) The diagnosis in all these cases was easily made on signs and symptoms characteristic of typhoid in adults.

(2) The cases were all intimately associated with others in the family.

(3) Skepticism should be encouraged concerning any diagnosis of typhoid fever in an infant (under two years of age) not intimately associated with other cases.

(4) The most common mistakes arise from misnaming as typhoid the following diseases: Grippe, subacute catarrhal enteritis, central pneumonia, and malaria.

A Rapid Method of Fixing Blood-films for Ehrlich's Stain.—SOLLEY (*Presbyterian Hospital Reports*, New York, 1900, vol. iv. p. 169) has endeavored

to find some suitable rapid method of fixing dried blood films to take the place of the slower method of fixing by heat. Various agents were tried without success, the main difficulty being in getting something to fix both the red and white cells equally well.

G. A. Tuttle experimented with solutions of chromic acid of various strengths. He eventually found that a 2 per cent. solution of chromic acid poured on the film and allowed to remain for exactly thirty seconds gave uniformly good results, both red and white cells taking up their special stains clearly and surely. Solley states that the nuclei and granules of the leucocytes stain quite as sharply as in the best specimens fixed by heat, while the protoplasm of the mononuclear lymphocytes is usually better stained than by the latter method.

After the chromic acid solution has been on the smear for thirty seconds it is thoroughly washed off, the excess of water being removed by tapping a corner of the square on filter paper. Ehrlich's triple stain is allowed to remain on the smear for three minutes. The stain is then washed off, the smear dried between filter-paper, and then mounted in balsam in the usual way.

Unfortunately, the article does not state whether the chromic acid is dissolved in water or alcohol, but it is inferred that the former is used.

SURGERY.

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Median Osteotomy of the Hyoid Bone as a Method of Performing Pharyngotomy.—VALLS (*Rev. de Chir.*, May 10, 1900) proposes this new operation in order to overcome some of the dangers and difficulties that surround the removal of malignant or benign growths from the pharynx or the base of the tongue, and that are met with in the complete removal of the tongue.

The method of operating is as follows: An incision in the median line is carried from the mental symphysis to the thyroid cartilage. The skin and subcutaneous tissue can be incised at one cut. The bleeding is insignificant. The next step is the denudation of the hyoid bone in the median line. The superficial cervical aponeurosis is incised, the myohyoid muscle is raised in the median line by using the grooved director, so that its upper border can

be severed from the hyoid bone in the median line. Here an arteriole or two may be met. The hyoid bone is then resected in the median line with the bone forceps. The two parts of the myohyoid can then be gradually separated with it, thus providing an opening about an inch and a half wide.

Two ways are open to the surgeon: Below is the thyrohyoid membrane, above the mucous membrane alone separates him from the pharynx. The closure of this wound is very simple after the operation has been completed. It is not necessary to attempt an osseous suture. The result is functionally as good if the muscle and fibrous tissues are sutured. The result in fibrous union is just as efficient from the functional stand-point.

A preliminary tracheotomy has not been found essential to successful operating when this incision is employed, except where the operation involves the larynx directly.

The superior route is to be employed in total removal of the tongue or removal of tumors from its base, while the other route is the best for attacking tumors of the pharynx, especially of the epiglottis, and foreign bodies.

The author formulates the following conclusions:

1. The median osteotomy of the hyoid bone is a simple, easy operation and essentially benign.

2. It permits the penetration into the pharynx and gives a better view and operative field than does Malgaigne's superhyoid operation. Foreign bodies, enucleable benign tumors, cancers limited to the epiglottis, and especially grave syphilitic lesions, are its indications.

3. It facilitates the removal of intramuscular tumors at the base of the tongue, lipomas, and hyoid cysts which are difficult to remove by the lateral route.

4. It facilitates the total amputation of the tongue in cases where the cancer is situated in the base. The amputation is complete, and is less dangerous by this method.

5. There are no remote sequelæ from the osteotomy. It leaves no deformity behind it or functional disability.

Two Cases of Œsophageal Diverticulum.—RICHARDSON (*Annals of Surgery*, May, 1900) reports the case of a gentleman, aged fifty-three years, who came to him in consultation, having had symptoms of an Œsophageal diverticulum for some years. Although it had caused symptoms its presence was not discovered till a year after they commenced. An Œsophageal bougie of considerable size can be passed without difficulty.

The diverticulum was found on the left side of the neck, with its orifice at about the level of the cricoid cartilage. It fills with the first food swallowed at a meal, but the distended pouch does not further interfere with deglutition. The pouch can be partly emptied by a voluntary muscular effort soon after eating. It can then be swabbed clean by the patient with a cotton-tipped bougie. In the past three years the diverticulum has increased in depth about one-half, and perhaps doubled its capacity. It held about one ounce at the first examination made by the author. The author at this time gave the opinion that the diverticulum, although not causing the patient serious inconvenience at the time, ought, in the near future, to be operated upon because of the tendency of these lesions to get worse. The operation

advised was external œsophagotomy with closure of the œsophageal wound immediately, and packing of the external wound for a day or two.

The patient was seen for the second time about five years later. There had been some increase in the dysphagia, and choking at table had been more troublesome. His general health had not suffered much. The probang could be passed into the pouch, but not by it. No tumor could be felt, whether the pouch was empty or not. The age of the patient and the increasing dysphagia led the author to operative intervention, as delay, with increasing years, would render the operation more dangerous. The danger of the formation of phlegmons and the setting up of a general sepsis was also considered.

The operation was performed under ether. The excessive flow of mucus was controlled by a hypodermatic of atropia, which was found very successful. The lateral incision along the anterior edge of the sternocleidomastoid was made. To get a clear view of the field the anterior belly of the omohyoid was cut. Especial care was taken to avoid the recurrent laryngeal nerve and thoracic duct. The great vessels of the neck were at the lower angle of the wound, which was dry without the use of a single ligature. The pouch was not readily found, but was discovered by the blunt dissector between the œsophagus and the vertebræ. It extended down behind the œsophagus nearly to the arch of the aorta. The sack was loosely attached and readily drawn out after blunt dissection. The œsophageal opening was difficult to find and was discovered by passing a probang. The fundus of the pouch was opened, its extent determined, the neck resected and united by an interrupted suture in the mucous lining and a Lembert suture in the body of the external layer.

The external wound was closed except a small opening where a gauze drain led down to the line of suture. The suture-material of the internal or mucous suture was fine catgut, the others silk. The patient recovered rapidly. The greatest discomfort was from the expectoration of mucus, the greatest pain from swallowing. The difficulty in swallowing gradually disappeared. The packing was removed on the fourth day. The stitches were out on the seventh. The wound was entirely healed on the tenth day. No difficulty has been experienced in swallowing since.

The second case presented symptoms that were not as marked, but the diagnosis seemed reasonably certain. Gastrostomy was considered, but deemed inadvisable, and operation on the stricture and removal of the diverticulum was decided upon. The operation disclosed a condition similar to the first case, but with the addition of a stricture cicatricial in character lined with a mucous membrane that was friable. In examining the œsophageal stricture the mucous membrane was torn, and it was decided to divide the stricture and increase the calibre of the œsophagus by utilizing the pouch as a portion of its wall. The operation was successful, and at no time since has there been any obstruction of the œsophagus or difficulty in the passage of food. The suture was not, however, sufficiently close, and leakage was expected, so gauze wicks were left down to the line of suture. The patient recovered with a fistula, which, however, decreased in size so that very little fluid and no solid food escaped.

The Surgical Treatment of Dilatation of the Stomach.—BIDWELL (*Lancet*, April 7, 1900) makes the following classes as the principal causes of

dilatation of the stomach: (1), cicatricial contraction of the pylorus, due usually to old gastric ulcer; (2), malignant disease of the pylorus; (3), adhesions outside the pylorus; (4), gastropptosis; (5) spasms of the pylorus from ulcer or from excess of free hydrochloric acid; (6), atony (?); (7), various neuroses; and (8), floating kidney on the right side.

In reference to the various methods of examination he points out that on inspection of a case of pyloric stenosis one often sees not only a rounded tumor caused by the dilated stomach, but waves of peristalsis passing across the abdomen from left to right. By auscultation we may hear splashing sounds within the stomach, and bubbling of gas in the region of the pylorus. Intubation is a most valuable method, and its use should never be omitted in the examination of a case of dilated stomach, except where active ulceration is strongly suspected. A soft rubber tube is swallowed by the patient with practically no discomfort, and the stomach contents can then be evacuated by expression on the stomach or by the attachment of a siphon-tube. It is usual, an hour before using the tube, to give Ewald's test breakfast, which consists of a plain roll and half a pint of warm water or weak tea; the fluid obtained after extraction is available for the application of chemical tests. To cause artificial distention of the stomach the two constituent parts of a Seidlitz powder may be given separately in a little water. The carbonic acid gas thus generated causes dilatation of the stomach, and enables one to define its limits with precision. This method, however, causes considerable discomfort to the patient, since carbonic acid gas causes spasms of the pylorus; less discomfort is experienced if the stomach be distended by air pumped in by means of the stomach-tube. The chemical examination of the stomach contents is undertaken to determine whether there is an excess or absence of free hydrochloric acid and whether lactic acid and acid lactates are present. The simplest test for hydrochloric acid is a solution of phloroglucin and vanillin in absolute alcohol. A few drops are placed on a china plate and a drop of the stomach filtrate is placed close to it, so that the edges of the two drops coalesce. The plate is then warmed, and if any free hydrochloric acid is present a red tinge appears; the amount can be estimated by making a control test with a 0.1 per cent. solution of the acid. The easiest test for lactic acid or acid lactates is to place a few drops of neutral ferric chloride solution in three drachms of 1 to 20 carbolic acid solution, and then add water until an amethyst blue color results; a few drops of the stomach filtrate added to this will produce a yellow coloration if lactic acid or acid lactates be present.

These tests are of importance in distinguishing between the various forms of dilated stomach; thus in malignant disease we usually get a large amount of lactic acid and an entire absence of hydrochloric; in gastric ulcer or cicatricial contracture due to this we find an excess of free hydrochloric acid, and in dilatation due to gastropptosis or to neuroses we often find the amount of free hydrochloric acid fairly normal. These are not, however, absolute rules, and have their exceptions. The presence of a tumor is not a guide in malignant cases; if the tumor can be felt the disease is probably too far advanced for radical relief. A distinct nodule can, however, be felt sometimes in cicatricial stenoses, and a small movable tumor has been felt in two instances by the author. These are not all the symptoms, but these are of special im-

portance. Coffee ground vomit is symptomatic of malignant disease that is well advanced; it may be absent in early stages and its clinical significance is slight.

The symptoms of malignant disease of the pylorus that indicate operation are: (1), pain, usually localized to the pyloric region, and felt in the back; (2), signs of dilatation of the stomach; (3), retching and vomiting, usually only after solids; (4), peristaltic waves seen over the stomach area; (5), absence of free hydrochloric acid from fluids obtained on passage of the stomach-tube or from vomited matter; (6), progressive emaciation; (7), obstinate constipation; and (8), progressive anæmia. The age of forty is usually the dividing line between malignant and ulcerative stenosis.

The author then discusses the various methods of operating, and concludes as follows: This series of cases shows (16 cases) that operations for non-malignant stenosis of the stomach are very successful, the mortality is *nil*, and unless the case be left too late and the patient become exhausted with frequent vomiting, etc., there is no reason why the operation of pyloroplasty should not be absolutely successful. The most desirable operation in non-malignant stricture is pyloroplasty, since the opening in gastro-enterostomy seems to have a great tendency to contract. The same remark applies to Loretto's operation. The mortality of pyloroplasty is stated to be 11 per cent, but the author is inclined to think this too high in non-malignant cases. In malignant cases there is absolutely no question that the fatal issue in nearly all cases was due to the delay in seeking operative relief, and he is inclined to think that an operation undertaken in the early stages of malignant stricture will not be followed by a much higher mortality than a similar procedure in cicatricial stenosis. The important point, then, is to make an early diagnosis. Unfortunately, this is very difficult, and so an exploratory operation is to be recommended in doubtful cases. With regard to the nature of the operation, in cases where no tumor can be felt by palpation, and only a small one is found on opening the abdomen, pylorotomy should be performed. The risk is lessened by performing it in two stages, viz.: first, do a gastro-enterostomy, and then when the patient has been fed by the mouth for fourteen days, to build up the strength, the pylorotomy should follow. In advanced malignant disease gastro-enterostomy affords considerable temporary relief. He feeds his patients on the day following the operation by the mouth, and increases gradually without bad results.

A Case of Suppression of the Urine of Sixty Hours' Duration Treated by Operation.—JAFFREY (*The Lancet*, March 3, 1900) reports the case of a man, aged fifty-three years, who was brought to him after a suppression of urine had existed for sixty hours. He had suffered a dragging pain in the region of the left kidney a month previously. Micturition was frequent; his urine appeared natural in color, and he had never seen any blood. No definite tumor could be felt until the third day after the suppression commenced, then an apparently hydronephrotic kidney was detected. He had never had any trouble with his urinary tract.

When first seen his expression was anxious and he was restless. There was marked perspiration, especially of the hands, and the tongue was fairly moist. The pulse was rapid (124) and intermittent, dropping a beat about

every seventh beat, and the respirations were 24. He complained of considerable pain and tenderness over the region of the left kidney. A large tumor in the lumbar region could be palpated, but was very tender.

The operation disclosed, instead of a hydronephrosis, a mass of blood-clots, more than a pint, between the perinephritic fat and the kidney, and on incising the capsule blood was found between the capsule and the cortex. The kidney was enlarged and congested, and its pelvis was filled with blood-clots. No calculus was felt. A sound detected none in the upper part of the ureter.

Two hours after the operation was completed and a drainage-tube introduced the dressings had to be changed, as they were soaked with urine. The tube slipped out during the night, and was not replaced. Thirty-six hours later practically all urine was passed by the urethra. The first urine passed contained blood, but not in any quantity; it gradually decreased and disappeared.

The author recalls a similar case, which was too near death for operation, in which an analogous condition was found in the kidney. A small, scale-like calculus was found obstructing the ureter. It would have been readily displaced by manipulation. The author believes that such may have been the cause in this case.

In reference to operation he holds that in these cases, if one is certain of the diagnosis, the sooner the kidney is explored the better. There is difficulty in many cases in ascertaining which kidney is affected. Laparotomy and the examination of both kidneys have been recommended, followed by lumbar incision and the removal of the stone, but there are many cases recorded which have been operated upon and in which no stone has been found.

The Technique of Lumbar Puncture.—CONNER (*New York Medical Journal*, May 12, 1900), in discussing the choice of location at which the puncture shall be made, says there are three chief requirements to be considered:

1. That the needle shall find ready entrance to the subarachnoid space.
2. That the tapping be made at a point least likely to admit of damage to the nervous structures of the canal.
3. That the fluid obtained shall be as rich as possible in sediment.

In reference to the selection of the point of puncture he says that with free access through three lower spaces he sees no reason for selecting the second space. The floating nerve-roots of the cauda equina move about so readily that they are not likely to be damaged, even if touched by the point of the needle.

The last requirement, that of obtaining fluid richest in sediment, is best fulfilled by tapping in the lumbosacral space. Puncture in the upright position should in general be confined to children. Whatever the position, as much ventral flexion of the spine should be secured as possible.

General anæsthesia in most cases is unnecessary. By anæsthetizing the skin with cocaine or a freezing spray the needle can usually be introduced with very little discomfort.

The determination of the landmarks can be readily made by counting from the twelfth dorsal to the first spinous tubercle of the sacrum. When the patient is very fat or muscular the point can usually be determined by a

line between the highest points of the iliac crests. When the spine is flexed this line usually passes near the upper edge of the fourth spine. Occasionally it will cross the space between the third and fourth spines.

"An antitoxin needle 4 or 5 cm. long and 1 mm. in diameter serves admirably in children. For adults the needle should be 8 or 9 cm. long and of a diameter sufficient to give the rigidity needed to penetrate the tough ligament readily.

"An approximately accurate idea of the pressure can be obtained by using a bent glass tube of small calibre. The short, horizontal limb is attached by a bit of rubber tube to the needle, while the long perpendicular limb will record the height of the column of fluid.

"After the desired space is located the interval between the spines is marked with the finger of the left hand, and the needle is introduced at a point opposite the upper edge of the lower spinous process and in a line just outside. The needle is directed very slightly upward and toward the median line, with a view to having it in the median line when it enters the subarachnoid space. In children the puncture can, as Quincke says, be made directly in the median line; but even in children the supraspinous and interspinous ligaments often offer considerable resistance, and it is usually wiser to avoid these by going slightly to one side. As the needle passes through the interlaminar ligament the resistance is increased, and a slight, grating feeling is noticed; beyond this the needle slips in very easily, and is introduced until fluid begins to appear in the syringe.

"In children the fluid is reached at a depth of from 2 to 3 cm.; in adults, at from 4 to 7 cm. If bony resistance is met in introducing the needle, the latter is to be withdrawn for a slight distance and directed at a slightly different angle. After the fluid appears the syringe is taken off and the fluid is collected in the sterile tube. In the horizontal position it flows drop by drop. In the upright position it frequently runs in a gentle stream. It is much better to let the fluid run from the needle than to aspirate with the syringe. The sudden reduction of pressure by aspiration may easily produce unpleasant symptoms. Occasionally, when the flow through the needle is unsatisfactory, it may, however, be necessary to apply gentle suction with the syringe.

"The amount of fluid to be removed will depend upon the purpose of the puncture. If for diagnosis alone, 10 or 15 c.cm. are usually ample; if for therapeutic purposes, it may be desirable to remove several times that amount. Perhaps the safest guide is the condition of the patient. Headache, faintness, or a change in the character of the pulse are indications to stop."

The Treatment of Some Forms of Appendicitis at Plombières without Operation.—KEITH (*The Lancet*, March 3, 1900) describes two cases which were distinctly benefited and one cured by the treatment at the baths of Plombières. The treatment consisted in forty- to fifty-minute baths at a temperature of not less than 34° C. and not more than 36° C. After the first few baths and for the last ten minutes of each succeeding one the Tivoli douche was used. "This is simply a spray of warm water coming out of a rose somewhere about an inch in diameter. It is allowed to play

against the affected part like a feather." This is a most important point. If it be used too strong it seems to do harm, as there is almost certain to be an attack of pain where the douche is improperly used in this way. After the baths the patient had to lie down in bed for half an hour.

Of course, this treatment is not adapted to all cases, nor can it cure a condition that can be relieved by surgical measures alone. This author's experience has shown him that the treatment at Plombières is very successful in cases of chronic diarrhoea, in constipation (though at first sight this may seem peculiar), in mucous colitis, and in appendicitis. The baths—and the treatment is practically limited to baths, though some people drink a small quantity of water before lunch and dinner—are recommended for various other conditions, especially for rheumatism.

PEDIATRICS.

UNDER THE CHARGE OF

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A Case of Pneumothorax Complicating Whooping-Cough.—FRANCIS VILLY (*The Medical Chronicle*, May, 1900, p. 99) reports a case of this rare complication of pertussis. The patient was a boy, aged three years, who was admitted to the hospital suffering from a severe attack of faucial diphtheria complicating whooping-cough, and convalescing from measles which had begun nine days before, and was accompanied by otitis media. The faucial condition cleared up rapidly, but meanwhile the attacks of coughing, which were slight and infrequent at first, became very numerous and severe. From the beginning the pulse rate had been rapid, as is often observed in those who suffer from diphtheria and whooping-cough together. The rate of respiration was also increased, but no abnormal physical signs were to be found in the lungs, nor in the heart beyond a shortening of the first sound. Definite abnormal physical signs were found in the lungs for the first time three weeks after admission to the hospital, in the form of râles heard all over both lungs, but especially at the bases; several small areas of rather doubtfully impaired resonance were noted. When first seen by the reporter, a week later, the child was exceedingly ill. The pulse was rapid, regular and full, but of very low tension, 145 to the minute. Paroxysms were frequent and very severe, and in the interval respiration was shallow and rapid, averaging 80 to the minute. Several small patches of bronchopneumonia were noted at the bases posteriorly. By the next day râles had become very marked at the left base, while just below and internal to the angle of the scapula the breath-sounds were distant, and the expiratory murmur was pro-

longed and almost bronchial in type, but no dulness was observable. On the following day slight hyper-resonance was detected over the left base. The needle of an exploring syringe was inserted below the angle of the left scapula and gave issue to gas, which readily filled the syringe. Two days later aspiration was made under chloroform, with the idea of evacuating the gas and pus, if the latter were present, since the temperature had remained slightly and irregularly elevated since admission to the hospital. A considerable quantity of gas was evacuated, but no pus accompanied it. On the following day the differences in the physical signs at the two bases had disappeared, and steady improvement in the child's condition continued, the whooping-cough progressing slowly to ultimate recovery.

The Treatment of Whooping-Cough with Antitussin.—MAXHEIM (*Berliner klinische Wochenschrift*, December, 1899) reports his experience in the treatment of pertussis with this recently introduced remedy. Antitussin is a preparation containing five parts of difluor-diphenyl, ten parts of vaseline, and eighty-five parts of lanolin. It is used by inunction, a portion of the ointment as large as a walnut being rubbed into the skin three or four times a day. The writer reports sixteen cases in which this preparation was used with most gratifying results, nine of the cases being in the convulsive stage when treatment was begun. His conclusions are that antitussin has a marked anti-convulsive action in every case, and that the characteristic attacks are much lessened in severity, and the convulsive stage soon changes to the catarrhal; that it has a marked expectorant action, so that the tenacious mucus is easily expectorated; that when treated with antitussin at the onset, or shortly after, the disease will not pass beyond the catarrhal stage; that there is no toxic effect. The drug has been used in catarrhal diseases of the larynx and bronchi and has shown a marked expectorant action.

Panaris Due to the Diphtheria Bacillus.—SEITZ (*Correspondenz-Blatt f. Schweiz. Aerzt.*, 1899, No. 21) relates a curious observation under this title. He had occasion to treat a boy, aged sixteen years, for a small superficial panaris of the right middle finger, which healed rapidly after opening. Bacteriological examination of the pus showed the presence of streptococci, staphylococci, and an organism which at first was taken for a pseudo-diphtheria bacillus, but which was recognized, after inoculation experiments, as a true diphtheria bacillus sufficiently virulent to kill guinea-pigs in from two to three days. When this fact was established a culture was made from the throat of the patient, five weeks after the opening of the abscess on the finger, and virulent Klebs-Löffler bacilli were found. The boy stated that he was in the habit of biting his finger nails.

At the same time other members of the patient's family were examined; the throats of the father, the mother and a sister were free from the organism. But it appeared that a brother separated from the family for three months, and never having been in contact with the patient during this period, had had diphtheria about one month after the patient's panaris developed. The patient had therefore carried virulent bacilli in his throat without having diphtheritic angina and without infecting other members of his family.

Several other instances of diphtheritic panaris are related by HAU (*Lyon*

Médical, 1900, No. 4), one in his own person as the result of infection during an autopsy upon a child dead of diphtherial croup. Two other cases were observed in the same hospital about this time among the nurses, the location in both instances being on the palmar surface of the ungual phalanx of the thumb. All three cases were characterized by the absence of false membrane and by the presence of a sero-purulent liquid rich in bacilli. The acute stage was short and the general reaction slight. Constitutional treatment was not employed. Disappearance of the bacilli was not obtained until the surface of the lesion was exposed to light and air.

Treatment of Thrush.—ESCHERICH (*Semaine Médical*, 1900, in *Revue Mensuelle des Maladies de l'Enfance*, June, 1900, p. 304) makes use of an ingenious device for the treatment of mycotic stomatitis. He directs that a small tampon of sterile cotton be impregnated with about 20 centigrammes of boric acid finely pulverized and mixed with a small quantity of saccharine. The cotton is then enclosed in a little sac of silk or batiste carefully sterilized, and this is given to the infant to suck. Ordinarily the child will continue to suck it on account of the sweet taste imparted by the saccharine. The boric acid is thus slowly dissolved by the saliva and acts directly and continuously upon the *oïdium albicans*. A fresh sac is to be used on the following day.

The effect of this treatment is said to be rapidly manifest. In recent cases, when the deposit is not very extensive, it disappears entirely within twenty-four hours, except in the gingivo-buccal sulcus, from which it is removed during the next twenty-four hours. In the inveterate cases cure requires a somewhat longer time, but may be hastened by mechanical cleansing and lavage of the mouth with appropriate washes.

This method of treatment is not of value in moribund cases in which the power of sucking is lost and the saliva is not secreted.

The Treatment of the Laryngitis of Measles.—SEVESTRE (*Société de Pédiatrie*, Séance, April 9, 1900) prefers intubation to tracheotomy when operative interference is necessary. In 1898 and 1899 he operated upon 40 cases of laryngitis of measles complicated by diphtheria. Intubation gave 20 recoveries out of 34 cases, while all of three cases submitted to tracheotomy died, and of 3 cases subjected to tracheotomy after intubation all recovered.

In the uncomplicated laryngitis of measles the results are bad for all forms of intervention. In 10 intubations Sevestre had 8 deaths, in 2 tracheotomies 2 deaths, and in 2 intubations followed by tracheotomy 1 death.

Ulceration of the mucosa, which is the chief disadvantage of intubation, can be avoided, in a certain measure, by not leaving the tube long in place and by employing tubes of small calibre. Intubation has the advantage over tracheotomy of exposing less to secondary infection. Expectant treatment should be faithfully tried before deciding upon surgical intervention.

Chronic Vomiting Due to Rhinopharyngitis and Adenoid Vegetations.—BRETON (*Revue Mensuelle des Maladies de l'Enfance*, May, 1900, p. 235) reports the case of a child, of five years of age, in whom almost uncon-

trollable vomiting appeared to be directly due to nasopharyngitis and adenoids. Vomiting had begun about a year before observation, at first occasionally, but finally it had occurred after almost every meal. Shortly after food was taken into the stomach it would be rejected more or less completely. As a result of this continued loss of nourishment, serious impairment of health followed.

Examination of the digestive organs revealed a dilatation of the stomach and cæcum, and of the transverse colon. The stools contained mucus, were hard and required solicitation, being passed with considerable discomfort.

The tonsils were somewhat enlarged and adenoid vegetations were studded over the wall of the pharynx, and extended into the nasopharynx, while the nose was the seat of a double rhinitis.

After removal of the adenoids and treatment of the nose the vomiting ceased completely and the general condition of health at once improved. A return of vomiting was found to coincide with a relapse of the nasopharyngitis, and after this was successfully treated the vomiting again ceased.

Scarification versus Denudation by Caustic Potash as a Means of Preparing the Skin for Vaccination.—FIELDER (*Medical Record*, vol. lvii., No. 4) criticises the efficacy of the method of preparing the skin for vaccination which was proposed by Hutchin. This is accomplished by denuding an area of the skin by means of liquor potassæ or the stick of caustic potash. After a series of experiments in which primary vaccinations were made both by scarification and by denudation, he concludes that scarification is the more satisfactory method. Denudation by caustic potash is less painful to the child and does not draw blood, but it takes a longer time, requires more skill, presents difficulties in getting the denuded surface small enough, so as to prevent the formation of too large a vesicle, and it is less certain than scarification, because of the formation of an eschar which interferes with absorption.

Fœtal Rickets.—FEDÉ and CACACE (*Pediatrics*, February, 1900) discuss in considerable detail the literature upon this much-disputed question, which dates from the description of the condition given by Glisson in the seventeenth century. Since then numerous cases have been recorded as examples of fœtal rickets. Certain observers, like Rednar, Kassowitz, Schwarz, Cohn, Quisling and Lentz, have maintained that such a condition as fœtal rickets is of frequent occurrence, while another group claim that it is quite rare, or even does not exist, the cases so described being in reality non-rhachitic in nature.

The writers have therefore undertaken a systematic study of the external characteristics of new-born infants, with careful histological study of the bones of normal and of so-called fœtal rhachitic cases.

This study embraced 500 new-born infants observed in the maternity of the Hospital for Incurables in Naples. In each case measurements of the length of the body, of the circumference of the head and thorax, of the fronto-occipital arc, and of the biparietal arc were recorded.

Of the 500 infants studied, 474 were born at term, 22 at 8 months, 4 at 7 months. Of the full-term infants 248 were males and 226 females; of the

22 born at 8 months, 12 were boys and 10 girls, while of the 4 born at 7 months 2 were boys and 2 girls.

Craniotabes was present in 3 cases out of the 474 born at term, and in 1 of the 22 born at the end of the eighth month of gestation. Only one case in the 500 could be said to have the clinical signs of rhachitis. The authors therefore conclude that since only 1 case in 500 showed distinct signs of rhachitis, and only 4 had craniotabes as the sole rhachitic sign, foetal rickets must be a very rare affection.

THERAPEUTICS.

UNDER THE CHARGE OF

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Resaldol.—DR. HERRMANN states that this is a condensation product of resorcin with saloform, the latter in turn being chlormethylene salicylic acid. It occurs as an amorphous, yellow, light powder, which is soluble in water, in the usual weakly acid solutions, but more readily soluble in diluted soda, and particularly in alkaline solutions. Theoretically, on breaking up, it should exhibit the antiseptic properties of salicylic acid with the astringent effects of resorcin, and since it is soluble only in alkalies these effects should be exhibited chiefly in the intestines. The powder is of an astringent taste. Because it is rather difficult to swallow, capsules or wafers are prepared for its administration. The remedy is relatively harmless, for a daily amount of 150 grains produces no untoward symptoms. It seems to be effective when given by enema in amount of fifteen to thirty grains in six ounces of barley water. Since it is not without some influence upon bacteria, the results of its administration to a patient suffering from chemico-infectious diarrhoea is of interest. Three patients suffering from intestinal tuberculosis received benefit. On the other hand, in typhoid fever the results were not positive. The intestinal catarrh of children and chronic catarrh of the large intestine in adults yield to the remedy. For the former three five-grain doses are given daily; for the latter, about fifteen grains thrice daily.—*Therapeutische Monatshefte*, 1900, Heft 4, S. 199.

Ichthoform.—DRS. S. RABON and B. GALLI-VALERIO have studied this substance, which is a combination of ichthyol and formaldehyde. Experimentally it is shown to hinder the development of bacterium coli, bacillus typhosus, bacillus icteroides, bacillus pyocyaneus and staphylococcus pyogenes aureus. It is in small quantities an active deodorant; and is, so far as evidence is afforded by frogs and guinea-pigs, non toxic. As an internal antiseptic, thirty to forty-five grains have been administered for several days at a time in various intestinal diseases, with good results; no unpleasant symp-

toms have been observed. Two instances of its use in intestinal tuberculosis did not result in any definite conclusions as to its value. As an external application Rochaz reports excellent results, and even believes that it is a substitute for iodoform.—*Therapeutische Monatshefte*, 1900, Heft 4, S. 202.

[It is quite remarkable that this as well as the preceding remedy is not of demonstrable effect in intestinal tuberculosis. Apparently the intestinal antiseptic of choice will be neither of these.—R. W. W.]

The Hypnotic Action of Apomorphine without Nausea.—DR CHARLES J. DOUGLAS states that this remedy is a prompt and wellnigh infallible hypnotic when injected subcutaneously in doses of about one-thirtieth of a grain. Although this amount is about the average hypnotic dose, yet for some patients it is too large, as it produces nausea, while in others a larger amount will cause no disagreeable symptoms. The dose should be so adjusted as to be large enough to produce sleep and small enough to avoid nausea. This being only about one-third of the ordinary emetic dose, it is, of course, perfectly harmless. When thus administered it acts with precision. Both in mild insomnia and in furious delirium it produces in from five to twenty-five minutes a sleep which is refreshing and restful. On waking there are none of the unpleasant symptoms which follow sleep when induced by drugs. As its action is so prompt, it is advisable to administer it when the patient is in bed or quite ready for bed. Its direct hypnotic action appears to last from one to two hours, but in many instances the patients will sleep all night. If a saturated solution of boric acid is employed to secure antisepsis the apomorphine becomes entirely inert. There is no danger of forming a drug habit. In addition to its hypnotic action it is also a cardiac stimulant, sudorific and antispasmodic.—*Merck's Archives*, 1900, No. 6, p. 212.

[The suspicion may be entertained that the apomorphine is not always pure. Some preparations, at least, are far from producing hypnotic effects.—R. W. W.]

The Palliative Treatment of Paralysis Agitans.—DR. R. T. WILLIAMSON reports that he has found the following drugs useless: arsenic, quinine, potassium bromide, strychnine, calabar bean, cocaine, cannabis indica, caffeine, atropine, silver nitrate, codeine, gelsemium, cannaosis tannade, butyl chloral, chloral hydrate, potassium iodide and piscidia. Various authors have stated that hypodermatic injections of hyoscine hydrobromate, duboisin sulphate and morphine have yielded good results, but in a disease of such long duration it seems undesirable to make use of this method. The only drug which has proved to be of real service is hyoscine hydrobromide in larger doses than $\frac{1}{150}$ of a grain given in solution in chloroform water. The maximum dose of $\frac{1}{8}$ of a grain two or three times daily by the mouth can be given for long periods without toxic effect, although it is well to watch for symptoms. This not only diminishes the severity of the constant tremor, but it renders the patient more comfortable; it diminishes the general restlessness and uneasiness and the constant desire to change the position, which is such a troublesome symptom of the disease. For sleeplessness a little whiskey and water may be taken at bedtime, or sulphonal may be employed. If this is not successful, a fourth dose of hyoscine and even a larger one may be taken

at night. Life in the open air should be encouraged, and all forms of mental excitement and worry must be avoided. Wine or alcoholic drinks must be forbidden, and only weak tea and coffee should be taken.—*The Practitioner*, 1900, No. 382, p. 407.

[A considerable personal experience with the above method sanctions its indorsement.—R. W. W.]

The Treatment of Delirium Tremens.—DR. CHARLES G. STOCKTON first administered a purgative and later one or two drachms of potassium bromide with thirty grains of chloral or less if the patient is not a robust individual with a strong heart. This may be repeated if necessary, and should the heart fail, digitalis may be given by the mouth or hypodermatically. Later hyoscyamus, camphor or opium may be necessary. Alcohol must be forbidden, and in place a safe, immediate stimulant, as beef-tea with capsicum, freely as a condiment. Diffusible stimulants, like compound spirit of ether, or strychnine, digitalis and nitroglycerin, may also be given. Aloin in half-grain dose, if chemically pure, may be administered hypodermatically, and will produce a full evacuation; even magnesium sulphate may be given in the same way. Hyoscine hydrobromate in one-hundreth of a grain dose can be given subcutaneously and repeated after two hours; this stimulates both circulation and respiration, but it gives relief at a great expense of tissue and disturbance of innervation. The patient is made quiet but is exhausted by the drug, which is, therefore, only permissible when the delirium is only a temporary one.—*The American Therapist*, 1900, No. 9, p. 171.

Phthisis Pulmonalis Treated with Nascent Ammonium Chloride.—DR. J. C. BALLARD considers that in incipient and advanced phthisis that part of the bronchi and air vesicles occupied by the tubercle bacillus is also in a septic condition. Climatic treatment being impracticable, the following is recommended. An inhaler arranged as follows: A glass jar is filled three-fourths full of pure water and alkalized with half a drachm of aquæ ammoniæ. Into this is dropped the selected remedy. A small test-tube is fitted into the rubber cap of the jar; it is filled with sodium chloride and saturated with pure hydrochloric acid. Over this salt vessel is a glass tube arranged so that it fails to touch the saturated salt by one-fourth of an inch; this glass tube curves on itself after emerging from the rubber cap, and re-enters the jar, descending into the ammoniated water. A mouthpiece just penetrating the rubber cap, but not entering the ammoniated water, completes the apparatus. When the patient inhales the air it passes over the saturated sodium chloride, absorbs some of the chlorine gas, and carrying it into the ammoniated water instantly forms nascent ammonium chloride, which, as a dense white vapor, is conveyed to the lungs. This vapor is antiseptic, expectorant, and stimulant. Results are immediate. The patient gains weight and strength. Nights are quieter, sleep is sound. Various remedies may be added to the ammoniated water, *e. g.*: Tr. iodine comp. and acid. carbolic. of each two drachms, glycerin to an ounce; add five drops to inhaler before using. Another formula is: Liquor iodoform (10 per cent.), campho-phenique, of each add ten drops to inhaler before using. Five drops of guaiacol, terebene, menthol, thymol, and spirit of chloroform are also

recommended. The vapor formed is charged with the remedy. The inhaler requires careful daily washing and a renewal of all its contents. Constitutional treatment is not to be neglected; especially are cod-liver oil and nuclein of service. The vapor will not destroy tubercle bacilli, but it lessens their activity and checks their increase, thus enabling nature to destroy them.—*The Therapeutic Gazette*, 1900, vol. xxiv. p. 156.

[Evidently this method is of considerable value if the recurrent pleas for its use be evidence.—R. W. W.]

Antipneumotoxin in Pneumonia.—DR. CHARLES B. CANBY reports three patients treated with Pane's serum. In one there was an initial left lower lobe pneumonia, treated in the usual way with alcohol, digitalis, and sufficient opium to quiet delirium. Crisis occurred on the eighth day. Two days later, following exposure, a second pneumonia developed on the right side. Patient was delirious; temperature, 104° F.; pulse uncountable; respirations, 56. Three drachms of serum were injected. In three hours the temperature fell 2.5°; diaphoresis was abundant; respirations 40 to the minute; the pulse remained uncountable. Following day, temperature and respiration were normal; pulse 96. The dose of antitoxin was repeated. Rapid recovery followed. Two pneumonias occurring in the same patient—the one treated in the usual way defervesced on the eighth day; the second, treated with serum, defervesced on the second day—suggests that the antitoxin produced a much earlier crisis than the first attack indicated as likely to occur. The second pneumonia was exceptionally severe and seemed likely to terminate fatally. A second patient, following an injection of the serum on the third day of his disease, defervesced on the fourth and progressed rapidly to recovery. A third patient received two and a half drachms of serum on the third day of the disease. The following day, temperature, pulse, and respiration were normal. Two days later she sat up in bed; had a chill followed with temperature of 105° F. Next day a second injection of two and a half drachms was given. Following day the temperature was again normal, and likewise pulse and respiration. Convalescence was uninterrupted. Another similar result is also reported, in which five drachms of the serum were twice injected.—*Maryland Medical Journal*, 1900, vol. xliii. p. 113.

Cacodylic Acid.—DOTT. G. MANCHETTI states that this remedy contains about 53 per cent. of arsenic, and since it is essentially an organic compound it possesses chemical and physiological properties different from those of the common preparations of arsenic. For instance, in sodium cacodylate it is well borne in doses of from one and one-half to three grains when one-thirtieth of arsenic, as Fowler's solution, cannot be taken. He recalls the observed fact that soluble or insoluble mineral arsenic, when introduced under the skin or into the peritoneal cavity, is absorbed by the leucocytes, and thus assimilated as an organic form, can act upon other cells in the organism, particularly upon those of the motor centres. It has been further shown that when the fatal amount of mineral arsenic, when given by the mouth or hypodermatically, has been determined, a hundredth part of this amount is sufficient to cause death if it is brought into direct contact with the nervous

centres. Thus it is that metallic arsenic not modified by the white corpuscles is one hundred times more poisonous than that transported in the blood to the nerve centres after having been assimilated or organified by the leucocytes. Cacodylic acid given by the mouth, if it meets reducing agents in the alimentary tract, may become poisonous. So, also, sodium cacodylate has produced epigastric pain, intestinal disturbance, anorexia, and loss of weight. Even the kidneys, whose permeability it diminishes, may not escape, for not only is the amount of urine diminished, but a temporary albuminuria may appear. The subcutaneous method presents none of these inconveniences, and can be persisted in for long periods of time. The elimination is principally by the kidneys. This substance has been successfully employed in the treatment of incipient pulmonary tuberculosis, in various cutaneous diseases (psoriasis, lichen planus, lupus erythematosus, tuberculosis, and sarcoma), lingual epithelioma, and chorea. The dose varies from one to one and one-half grains of sodium cacodylate, given hypodermatically, up to six grains daily by mouth or rectum.—*Rivista Critica di Clinica Medica*, 1900, No. 14, p. 275.

DOTT. A. BORMANO remarks that sodium cacodylate increases the number of red blood-globules, and can be employed in anæmia and chlorosis when iron is not well borne. It gives better and more rapidly-attained results, even if the latter is tolerated. In all instances when arsenic is indicated this remedy can be given in much larger doses than it is believed can be useful to the organism.—*Gazzetta degli Ospedali e delle Cliniche*, 1900, No. 39, 415.

[The literature on this subject is practically unanimous, and the advantages of this remedy over other preparations of arsenic are real.—R. W. W.]

The Treatment of Membranous Colitis.—DR. W. H. THOMSON relieves the colonic symptoms by irrigation twice daily with from three to five gallons of normal saline solution at a temperature of 100° F., five drops of oil of peppermint being added to each pint. Sometimes benefit is derived from using at the end of the irrigation a gallon of water, to which sixty to one hundred grains of resorcin have been added, care being that all is expelled afterward. Once a week a pint of clean hot water, with thirty or forty grains of silver nitrate, may be used instead of the resorcin. As a medicinal remedy, which may be of service in changing the disordered nutrition of the intestinal mucous membrane, small doses of castor oil are advised. This is prescribed as an emulsion, of which each dose contains one-half to one drachm of the oil, preferably the former at first, to be taken either half an hour before or an hour after meals. Silver nitrate in quarter-grain doses, combined in pill or capsule with nine grains of resin of turpentine and taken three times daily, is serviceable. The turpentine should be well pulverized with licorice powder and a drop of liquor potassæ added to each capsule. After the silver has been taken for six weeks, copper sulphate in quarter-grain doses may be substituted for it. For the gastric symptoms five grains of resorcin in solution with tincture of nux vomica half an hour after meals, and supplemented with ten grains of sodium benzoate and an equal quantity of sodium salicylate in capsules after each meal, constitutes an excellent intestinal antiseptic. For the constipation one to two drachms of sodium phos-

phate with ten grains of sodium salicylate in a tumblerful of water as hot as the patient can bear it should be given each morning. Daily massage of the bowels is highly recommended. The diet should simply exclude beans, corn, spinach, and the woody vegetables, along with oatmeal. The use of meat, poultry, eggs, fermented milk, and peptonized milk, and most cereals should be encouraged.—*Medical News*, 1900, No. 1429, p. 852.

Treatment of Mucomembranous Enterocolitis.—DR. G. LYON first discusses the chronic form in adults. Treatment directed toward an improvement of the general health and neurasthenic tendency is advised. Stress is laid on a dietary that will insure sufficient nutrition, and not leave solid material in the intestine that will irritate mechanically. A strict vegetable diet does not leave a large residue. Milk is often not well borne. Glénard believes that an entire intolerance of milk is an indication of enteroptosis. Its use is advised only in small amounts in the preparation of soups, creams, etc. An exclusive milk diet is indicated only during paroxysmal crises. There follows a most liberal dietary, varying from soups to sweets. Intestinal atony requires constant watching.

The various laxatives cannot be indiscriminately used; drastic purgatives are contraindicated even in very moderate doses. Saline purges are valuable, but their prolonged use results in a constipation still more obdurate. Aloes is condemned for its congestive effect on the rectal mucous membrane. Hemorrhoids, so often complicating colitis, are aggravated by its use. Laxatives found most satisfactory are linseed and psyllium, which act by virtue of their essential oils. These failing, castor oil is preferred in one or two drachm doses in the morning. Following is a useful prescription: Calcined magnesia, washed sulphur, cream of tartar, of each five drachms. Rectal irrigations, variously composed, and glycerin suppositories, are mentioned as sometimes useful. If there be enteroptosis, rest in bed is necessary. Enterocolitis, occasionally due to nephroptosis, has been cured by attention to the latter condition. Ichthyol is highly recommended to reduce congestion in the intestine. It is best given by rectal lavage—one or two drachms in a quart of water. Picric acid is useful in mollifying the changes in the mucous membrane; it is used as an enema, fifteen grains of acid in thirty ounces of water. "Lavage of the intestine" (high rectal irrigations) is beneficial; it removes masses of hardened fecal matter, diminishes pain, spasm of the intestine and consequent retention of membranes, restores to the mucosa its functions of absorption and elimination, and by means of the temperature of the water it increases the contractility of the intestinal wall. The enteroclysis habit is a fact, and it causes great weakening of the patient in time. A hard-rubber tube is inserted into the rectum. The bag containing the irrigation should be raised not more than eighteen inches above level of bed to avoid undue pressure. The patient should lie prone; otherwise the fluid does not penetrate sufficiently into the intestine. Non-irritating antiseptics may be added to the water, such as sodium bicarbonate thirty grains, and sodium salicylate fifteen grains. About one quart of water is sufficient for each irrigation at first; later the amount is increased to three quarts. The patient, lying on the right side, will soon retain one or two pints of fluid, facilitating thus its entrance into the transverse colon. Tempera-

ture of water, 104° F. where great pain or spasm exists; 113° to 118° F. where atony is dominant. Irrigations once a day for a week, and then every second or third day. Injections of oil one pint, *technique* as above, protects the mucosa from scybala. High in the intestine digestion decomposes the oil into glycerin and acids, thus acquiring laxative properties.

An objection is that it requires half an hour to introduce the oil. When irrigations are prescribed, castor oil by mouth should be given also. Warm baths increase the comfort of the patient; if they are weakening, hot compresses on the abdomen are useful. Cold compresses (Priessnitz) may be substituted. Medicinal sedatives are calcic bromide, one-fourth to two drachms. Belladonna is most serviceable. Opium is contraindicated, causing constipation. Complicating gastric disturbance consists in hyperchlorhydria, and is best treated by a diet of eggs, milk, soft meats, also Vichy thrice daily, with sodium sulphate added, a third to one drachm. If there be diminished pepsin production and gas formation, small doses of sodium carbonate are sufficient. Strychnine is useful. A neurasthenic state is best treated by ammonium valerianate. Warm douches (104° F.) act well in erethism. If reaction is good, cold is substituted. In anæmia iron and arsenic are badly borne. Subcutaneous injections of sodium cacodylate (three-fourths of a grain) can be substituted. Paroxysmal painful crises simulate the various forms of colic, and require heat locally with morphine. Patients are very liable to acquire the opium habit. Such crises, due to intestinal spasm, require purgatives and injections to expel the mucomembranous casts. If fever be present, milk diet is indicated; kephyr may be substituted. If diarrhoea intervenes, saline purges are useful, as is also calomel, but it must not be too often repeated. Enterocolitis in the infant: If a nursling, frequency of feedings is diminished. If fed by bottle, sterilized milk is essential. In older children also milk alone is advised. Irrigations sometimes provoke pain early in the disease; they must be given cautiously. Twelve ounces of fluid are sufficient. It is best not to use them at all until baths and fluid diet have diminished the inflammation. Laudanum and antipyrin control undue tenesmus. Malodorous dejections require fractional doses of calomel. If there be dysenteric dejections, ipecac is indicated.—*Revue de Therapeutique*, 1900, Nos. 5 and 6, pp. 115, 181.

GYNECOLOGY.

UNDER THE CHARGE OF

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Correlation of Sexual Function with Insanity and Crime.—In an address on this subject delivered before the British Gynecological Society (*British Gynecological Journal*, 1900, No. 2) DR MACNAUGHTON-JONES presented the following conclusions: The relation between insanity and dis-

turbances of the sexual function due to pelvic disease must be considered in treating the insane. When such disease is suspected a thorough examination should be made. In investigating criminal acts committed by women with irregularities of menstruation due allowance should be made for their influence on the mental condition. The special dangers of the climacteric as regards the development of melancholia must be remembered. Post-operative insanity is rare and generally transient. Women who have been mentally unbalanced are most liable to become insane after operations on the pelvic organs. If mental disorders are noted at the menstrual periods and climacteric in a given case it is important to note the condition of the sexual organs and to operate if gross lesions are found.

Operations for Prolapsus.—SCHÜCKING (*British Gynecological Journal*, 1900, No. 2) describes an operation for prolapsus which consists in making a transverse incision through the vaginal mucous membrane in front of the cervix, dissecting off flaps and closing the wound vertically. If necessary the cervix may be drawn backward by making a vertical incision in the posterior fornix and uniting the flaps transversely.

THEILHABER thinks that prolapse of the uterus is comparatively rare as compared with that of the vaginal walls. Cystocele is due to relaxation of the anterior vaginal wall, and is practically independent of lesions of the rectovaginal septum. If anterior colporrhaphy is performed at all it should be a radical operation, all the prolapsed portion being removed. Unless this is done, the cystocele will recur, even when the pelvic floor has been thoroughly repaired.

ZIEGENSPECK (*British Gynecological Journal*, 1900, No. 2) claims that prolapse of the uterus is due chiefly to the separation of the levator ani muscles. He dissects off flaps from the posterior vaginal wall until the muscles are seen, and secures them with catgut sutures. The raw surface is then closed with buried catgut, and finally the flaps are united.

Bacteria in the Female Urethra.—SCHENK and AUSTERLITZ (*Prager medicinische Wochenschrift*, 1899, No. 17) examined sixty women, with a view to determining the presence of bacteria in the urethra. In over one-half of the cases saprophytic germs were found similar to those in the vestibule. Pathogenic germs are rare.

SAVOR (*Beiträge z. Geb. und Gynäkologie*, Band ii.) states that in cases of gonorrhœa more bacteria of various kinds are found than in uninfected patients. One hundred and twenty pregnant women were examined, of whom less than 25 per cent. were free from urethral germs. The number diminished after delivery. The practical inference is that in order absolutely to prevent cystitis in these cases it is not sufficient simply to disinfect catheters.

Parotitis Following Ovariectomy.—MALCOLM (*British Medical Journal*, December 16, 1899) reports a case of parotitis which developed on the sixteenth day after operation, the patient recovering promptly after the abscess was opened. He attributes the complication to direct infection from the mouth, a decayed tooth being in contact with the opening of the parotid

duct. Infection is favored by the dorsal position, by the dryness of the mouth due to fever, which also prevents secretion, and finally by the fact that the jaws are not used to any extent when the patient is on liquid diet.

Condition of the Uterus after Transplantation of the Ovaries.—RUBINSTEIN (*St. Petersburger med. Wochenschrift*, 1899, No. 31) conducted a series of experiments in rabbits in order to determine what changes take place in the uterus after transplanting the ovaries. He found that in all the cases in which the ovarian function persisted menstruation recurred regularly, and in several instances pregnancy followed. When, however, the ovaries atrophied, atrophy of the uterus also took place.

He concludes that it is not necessary that any nerve-communication should exist between the uterus and ovaries, the activity of the latter wherever they may be situated being sufficient to maintain the normal uterine function. The ovaries have a trophic function dependent upon the maintenance of their internal secretion; hence, the disturbances noted after castration are of a general character, and are not confined to the uterus.

Relative Frequency of Uterine Neoplasms.—WILLIAMS (*Bristol Medico-Chirurgical Journal*, 1899 No. 12) found that among 13,824 cases of neoplasm in both sexes 2649, or 19.2 per cent., were uterine. In nearly the same number Gurlt noted 29 per cent. Williams records the fact that in 4628 cases of cancer 34 per cent. were uterine; Gurlt makes the proportion 49 per cent. In 2649 cases of uterine neoplasms collected by the writer the proportion of malignant growths was 59.28 per cent. The cause of the frequency of uterine neoplasms is to be sought for in the fact that the uterus is rich in cells of a quasi-embryonic character. As Ribbert has shown, cancer develops by preference in epithelium, which shows a great biological activity.

Castration for Uterine Fibromyoma.—TÈDENAT (*Soc. des Sciences méd. de Montpellier*, February 9, 1900) reports twenty-six cases of oöphorectomy for fibroids, with two deaths. Although in every case the hemorrhages ceased entirely after operation, the writer concludes that it is only palliative, and has abandoned it in favor of hysterectomy.

He calls attention to the unusual amount of pain following this operation, which cannot be satisfactorily explained, since it is not observed in other cases of salpingo-oöphorectomy.

Operation without Preliminary Hæmostasis.—GOUBAROFF (*Annales de Gynecologie et d'Obstetrique*, May, 1900) argues in favor of ligating arteries separately during abdominal operations only after they have been divided. His conclusions are as follows: 1. By this method the topography of neoplasms can be studied more accurately. 2. There is an absence of venous oozing. 3. Secondary hemorrhage is impossible. 4. Pure ligatures are employed, with a correspondingly less risk of infection. 5. When tissues are ligated en masse it is impossible to note pathological details, which can be done most satisfactorily when the vessels are tied separately. 6. Undue tension and compression of the tissues are avoided.

[While the author's contention that ligation of arteries alone is more surgical than ligation en masse is undoubtedly correct, the advantages claimed are not always obtained at the operating-table. There is no reason why the ovarian and uterine arteries should not be isolated and secured in most instances; but in complicated cases it is often impossible to pick up smaller vessels while working deep within the pelvis. The claim that venous bleeding is entirely prevented by ligation of the large arteries is not borne out by experience, since we have seen most annoying venous hemorrhage even after preliminary ligation of both the anterior branches of the internal iliacs.—ED.]

Sclerosis of the Uterus.—RICHELOT (*Ibid.*) claims that this is a distinct pathological condition which should not be placed in the same category with metritis of infective origin, since it may exist in virgins or in women who have never suffered any puerperal lesion. Such a uterus is recognized pathologically by its increased size, extreme hardness, by the hypertrophied endometrium, and large eroded cervix. Microscopically the uterine tissue closely resembles that of a fibroid uterus.

The symptoms in young women are largely neuralgic, and are frequently attributed to cirrhotic or cystic ovaries, but persist after the supposed offending organs have been removed.

The writer concludes that this particular type of uterine disease is met with principally in neurotic and arthritic subjects; hence, he believes that in non-infectious metritis local treatment is more or less useless. He is equally skeptical about the results of intra-uterine medication in most cases of metritis of infectious origin, claiming that the cervix should receive the principal attention.

Torsion of the Fallopian Tube.—POZZI (*Ibid.*) reports three cases of pyo- and hydrosalpinx and one of tubal pregnancy attended with severe attacks of abdominal pain, in one instance simulating appendicitis. Attention is called to the difficulty of distinguishing sudden torsion of an enlarged tube from rupture of an appendicial abscess or of an ectopic sac. Torsion of the pedicle of a small cyst would also give rise to the same symptoms.

Opoththerapy.—MOSSE's monograph on this subject (reviewed in *Annales de Gyn. et d'Obstetrique*, May, 1900) concludes with some practical deductions with regard to the value of opoththerapy, which he distinguishes as direct and indirect.

The writer believes that ovarian extract is most useful in relieving pre-climacteric disturbances, although it is also indicated in the reflex troubles following the establishment of the menopause. Menstruation that has been prematurely arrested reappears after the use of the drug, but it has no influence in exciting the menstrual flow in young girls who have the *nisus* without any discharge of blood.

In discussing so-called indirect opoththerapy, he states that in cases of amenorrhœa due to anemia iron is preferable to ovarian preparations, while he is confident that they have no value in the treatment of osteomalacia as compared with castration.

Appendicitis in its Relation to Pelvic Diagnosis.—FALK (*Centralblatt für Gynäkologie*, No. 7, 1900) reports a number of cases to show the difficulty of diagnosing appendicitis and diseased adnexa. He does not agree with Martin's statement that a history of intestinal disturbances is a strong point in favor of the former affection.

As regards the coexistence of appendicitis and disease of the right tube and ovary, he quotes Martin's statistics to prove that this is less common than is ordinarily supposed (thirteen times in 276 cases of salpingitis). Dührssen found appendiceal complications in ten out of 322 abdominal sections, while Ochsner reported fifteen cases of secondary and tubal and ovarian disease in fifty-one cases of appendectomies.

OBSTETRICS.

UNDER THE CHARGE OF

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Ectopic Gestation ; Removal of Embryo, with Preservation of the Tube.
—In the *Centralblatt für Gynäkologie*, 1900, No. 22, JUNG reports two very interesting cases of ectopic gestation as follows: The first was that of a woman, aged forty-one years, in whom a tumor was found in the right side behind the uterus. This was undoubtedly connected with the right tube. On opening the anterior wall of the vagina, the hæmatoma was easily drained; the uterus brought down into the wound, and blood-clots sponged away until the right tube could be examined. It was found ruptured in the middle, but the tissues of the tube very little altered at the extremities. After the chorion and blood-clot had been removed a sound was passed into the tube and its lumen found to be intact. The tissue was then brought together with fine catgut. The patient made an uninterrupted recovery.

In the second case the uterus was retroflexed and fixed through adhesions. The left tube seemed normal; the right was thickened and enlarged. The tube seemed to lie behind the uterus. The operation was similar to the preceding. More difficulty was experienced in freeing the parts because of the adhesions. The pelvic viscera seemed embedded in a mass of old blood-clot and adhesions. The tube was opened and found to contain the remnants of an ovum, which was removed. A sound was then passed into the tube, and the two portions brought together upon the sound. Adhesions were loosened cautiously, and the vaginal incision closed. The patient made a good recovery.

[These interesting and very successful operations suggest new possibilities in the treatment of early ectopic gestation. If abdominal incision can be

avoided, if the ovum can be removed and the tube preserved, surgery can show far better results in conservatism.—ED.]

Dystocia from Uterine Fibroids; Hysterectomy; Recovery.—In the *Comptes Rendus de la Société d'Obstétrique, de Gynécologie et de Pædiatrie de Paris*, 1900, p. 62, LEPAGE reports the case of a woman in her second pregnancy who had lost her first child after a difficult forceps delivery, accompanied by free hemorrhage. During the second pregnancy she suffered from considerable abdominal pain and hemorrhage. Examination revealed a fibroid tumor so situated in the anterior wall of the uterus as to make it probable that delivery would have to be accomplished by abdominal section. The patient declined to enter a hospital. When labor began the foetus was found high in the uterus, in transverse position, the back in front, and the head upon the right side. A rather soft tumor occupied the lower portion of the anterior uterine wall. Hemorrhage occurred to a considerable extent, so much so that the foetal life seemed likely to be in danger. Accordingly, abdominal section followed by incision of the uterus was practised, and the child rapidly extracted and resuscitated. In view of the mother's exsanguinated condition, the uterus was brought out through the abdominal wall. Elastic ligatures were applied and the uterus was amputated, some difficulty being found in securing sufficient tissue to make a favorable stump. Several days after the operation the patient had a moderate rise of temperature, when the stump separated. Upon examination, a small pus-pocket was found, and a fistula gradually formed which opened into the vagina. As a result of the thorough antiseptic cleansing, this soon closed. The patient and child subsequently made a good recovery.

Tubal Pregnancy; Rupture with Hydrosalpinx and Twisted Pedicle.—In the *Comptes Rendus de la Société d'Obstétrique, de Gynécologie et de Pædiatrie de Paris*, 1900, p. 90, BAUDRON describes the case of a patient who had symptoms of ruptured tubal pregnancy, for which the abdomen was opened. Upon operation it was found that the tube upon the left side had contained the ovum, and that it had ruptured in the usual manner. A second tumor presented, the exact nature of which was not at first recognized. On further examination this was found to be a hydrosalpinx of the right tube. Both tubes and ovaries were removed. The patient made a good recovery.

[In these two cases we have pregnancy complicated, first, by a tumor of the womb; and second, a tumor of the Fallopian tube. In both cases interference could not be practised during pregnancy. Each patient was examined with a view of operation, but it was decided to wait and allow the embryo every opportunity to increase its maturity. In the one case, alarming uterine hemorrhage threatened both mother and child, and in the second case, ruptured ectopic pregnancy obliged the operator to proceed. So much is sometimes accomplished by the natural efforts at delivery in cases of pregnancy complicated by fibroids that it is always best to await the action of labor, standing ready to assist at any moment.

Hydrosalpinx may become so large and so complicated by adhesions as to become almost unrecognizable. The writer recalls a case of hydrosalpinx in which the tube unfolded the layers of the broad ligament and became as

large as a small foetal head. It was not until the tumor had been removed and opened that the correct diagnosis could be made.—ED.]

Antenatal Diagnosis.—In the *British Medical Journal*, 1900, pp. 1458 and 1525, BALLANTYNE contributes a paper upon this subject. He believes that antenatal diagnosis should include the discovery of normal and of plural pregnancy, of foetal death, of diseases and monstrosities of the foetus, hydramnios and morbid condition of the placenta. To arrive at an accurate antenatal diagnosis, the medical history of the mother and the history of the performance of the function of the pelvic organs must be carefully noted. The past history and present statement of the father, and the family history on both sides should be taken into account, while the condition of the mother during the pregnancy which is in progress must be carefully investigated. This should be supplemented by a very complete physical examination of the maternal organs, and especially of the abdominal viscera. The maternal urine and blood should also be subjected to examination to complete the investigation. The foetus should be examined by the hands, by the ear, and by such instruments of precision as are available for this purpose.

Attention is called to the importance of the maternal medical history as regards a disposition to cancer or other serious constitutional disorders. Women who have had disastrous obstetrical histories are often found to have suffered previously from neuroses of various kinds, from tubercle, alcoholism, syphilis, derangements of the kidneys, or rheumatism or gout. The morbid condition in reproduction and in the general health in these cases is probably due to a common cause. This also leads us to infer that the degenerative conditions, such as nervous diseases, insanity, arthritic developments, neoplasms, tuberculous predisposition, and the tendency to take alcohol and other toxic agents to excess, are apparently governed by the same laws as to transmission which preside over malformations, abortions, congenital debility, and other phenomena of antenatal pathology.

As regards the mother's reproductive history, the type of menstruation is of importance, especially in view of the fact that a diseased uterine mucous membrane predisposes to antenatal disease. The conditions as regards marriage are also important, as to whether marriage has occurred at early or late life, or whether those related have married.

The history of previous pregnancies is of great value. Abnormalities in pregnancy and in the foetus repeat themselves so constantly as to make this a very striking fact. In syphilis the antenatal phenomena diminish in virulence as the reproductive history of the woman progresses, while in alcoholism there is a marked tendency toward intensification. Ballantyne suggests that "repeating abortion" is a better term than "habitual abortion," usually employed.

As regards the paternal history, this is of great importance, especially in the question of age, the use of alcohol, and of other diseases. Attention is called to Sullivan's interesting contribution, which shows that so long as maternal alcoholism exists, abstinence on the part of the father does not much improve the prospects of the unborn child.

Family history is interesting and very suggestive in these cases. The tendency to multiple pregnancy, to monstrosities, and other malformations

remains very distinctly with certain families. Dissimilar heredity is also seen. Thus a parent with a minor malformation may produce offspring having a decided and extensive malformation.

Ballantyne urges that the closest scrutiny be given to the details of the pregnancy in seeking for evidence of foetal disease. The symptomatology of pregnancy must be normal to prove positively that the foetus is developing normally. If discharges persist from the vagina resembling menstruation, in the early months this may indicate a threatened abortion or a hydatid mole, or in the later months it may point to a low implantation of the ovum or to premature separation of the after-birth. This condition may also indicate a morbid state of the womb or an ectopic gestation. In other cases there is something abnormal in the feeling of the foetal movements. Violent movements resembling those of hiccough are sometimes observed, and in rare cases may be attended by abnormal presentations in labor. Abnormalities in the size of the uterus for the period of gestation draw attention to hydramnios, hydatid mole, twins, a monster, or dropsical foetus.

We must also note symptoms which are present in pregnancy, but which have nothing to do with the pregnancy itself. Thus erysipelas in the mother has been followed by a streptococcus infection of the endocardium in the foetus. Traumatism also producing injury in the mother may be transmitted to the foetus. The use of drugs and the commencement or continuance of drunkenness during gestation have a distinct effect upon the child.

In proceeding to study these cases by physical examination it is necessary to make a thorough investigation of the mother aside from the pelvic organs. Congenital anomalies in the mother may suggest the occurrence of such in the child. An acute infection in the mother may influence the child. Foetal conditions will often make themselves manifest by some abnormality in the mother's general state. Thus foetal death may be followed by the disappearance of varicosity of veins in the mother and by shrinking of the thyroid gland.

A physical examination of the maternal organs of generation must also be made. Such examination should include the breast, abdomen and pelvic organs. To proceed to a physical examination of the foetus in utero we examine the abdomen as critically as if we intended to perform an abdominal section. The outlines of the foetus, its comparative size, a normal or abnormal condition of the amniotic liquid and a careful study of the foetal heart are all included in this examination. The character of the foetal heart-sounds may indicate disease or malformation of the foetal heart, while the absence of the sounds suggests a strong suspicion that the foetus has ceased to live. Bubbling sounds in the uterus may denote the presence of gas from a dead foetus. The cephalometer may be employed for foetal measurements. The graphic representation of foetal movements enables us to detect variations in these movements, caused by malarial intoxication and other fevers, as in case of typhoid. The difficulties of skiagraphy do not make it likely that this method will be of great use in the study of the foetus. A further and most interesting field of investigation lies in the blood and excretions of the mother during pregnancy. In this direction there is every reason to believe that much interesting and valuable information may be gained.

During labor it is necessary to diagnosticate abnormalities of the foetus in

order to determine the necessity for various operative procedures. The hydrocephalic head can be recognized, also the enlarged abdomen of the dropsical child. Abnormalities in the meconium and other discharges may point to malformations in the excretory organs.

The Prevention of Dystocia Due to Foetal and Pelvic Disproportion.—In the *Medical News*, 1900, p. 1025, AYERS considers this subject at some length. In estimating the probability of dystocia through disproportion, he considers it very necessary to note the physical characteristics of the parents. He believes that the size and consistence of the foetus can be greatly influenced by the mother's diet, and describes various methods which have given a fair degree of success. In estimating the value of pelvimetry, he calls attention to the fact that external diameters must not be relied upon too implicitly, as large external measurements may be given by heavy bones which encroach more upon the pelvic space than light bones of different outside dimensions.

In determining the necessity for thorough internal examination he believes that the history of previous labors is of decided value. He calls attention to the dangers arising in funnel-shaped pelvises, and urges that measurements of the pelvic outlet be more generally taken. While cephalometry is interesting, it has not given such practical results as to establish its universal employment. Physical examination with palpation of the head remains the most available measure. Where dystocia is anticipated we may attempt to prevent it by restricting foetal growth, by the mother's diet, by inducing labor, or holding ourselves in readiness to perform an appropriate operation should labor not proceed successfully. Induced labor is the most available procedure among the well-to-do, the methods usually employed being the use of the sterile, flexible bougie, a small Barnes bag or the tampon, preceded by the administration of a full dose of castor oil.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
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Posterior Rhinoscopy.—Every now and then efforts have been made to combine the rhinoscopic mirror and tongue depressor so as to facilitate examination, but thus far they have been failures. DR. E. KRAUS, of Paris (*Annales des Maladies de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1), produces a new combination of mirror and spatula, in which the tongue depressor is smaller than is usually employed, and the lateral edges of which are turned upward so that it can be pressed from one side to the other without irritating the tongue. He claims that it is very efficacious, especially in facilitating operative procedures, and this we can readily believe.

Œsophagoscopy.—At a recent meeting of the Vienna Society of Laryngology (*Annales des Maladies de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1) DR. EBSTEIN reported two cases of foreign body in the œsophagus, in which removal was effected through the aid of the œsophagoscope, one patient being an infant, two and one-half years of age, who had swallowed a kreutzer piece, and the other a woman, twenty-three years of age, who had swallowed a fragment of bone.

Dr. Ebstein also presented to the Society a woman, fifty-six years of age, who had about five weeks before swallowed by mistake a solution of potash. Œsophagoscopy revealed at the level of the diaphragm some fibrous deposits upon losses of substance in the mucous membrane. Inflammation having the aspect of very red erosions of the mucous membrane was also observed below the cricoid cartilage.

Stricture of the Œsophagus.—DR. ARTHUR G. MINSHALL reports (*Philadelphia Medical Journal*, 1900, No. 110) a case of tight stricture of the œsophagus of but four months' duration, due to the accidental deglutition of a solution of caustic potash, and cured by a few treatments with electrolysis under a current of 10 milliampères; the internal electrode being a metal olive attached to the negative pole, and the posterior electrode a spongopiline pad placed over the sternum.

DR. JOHN S. PYLE, of Toledo (*Ibid.*), reports a case of stricture of the œsophagus resulting from typhoid ulceration, in which he overcame the constriction by passing fine digital silk sacks attached to a male catheter and distending them with water. In the case recorded the appliance gave the greatest satisfaction.

Nasal Polypi.—Instances are occasionally met with in which a great many nasal polypi exist, but the most astounding record we have encountered comes from DR. H. W. LOEB, of St. Louis, Mo. (*Journal of the American Medical Association*, April 21, 1900), who removed at one sitting 107 polypi, weighing 77 grains, and about the bulk of a two-ounce bottle. These were removed with the electric snare, which enabled him to work with rapidity and without hemorrhage. The subject was a negro man, who had been operated upon for a sarcoma of the orbit, with removal of the left eye.

Gangrene of the Tonsil.—A case of gangrene of the tonsil is reported by DR. ALEXANDER G. HOWE, of Brooklyn (*Philadelphia Medical Journal*, March 17, 1900). The patient was a man, aged twenty-six years, with a peculiar pallor and partial stupor or lethargy from pronounced toxæmia. The case had begun a week before with the symptoms of an unusually severe peritonsillar abscess, and with expectoration, within the last twenty-four hours, of a brownish, foul-smelling discharge. The patient was bathed almost constantly in a profuse perspiration, and had a pulse from 110 to 120. The gums, the inner surface and the under surface of the tongue were greatly swollen and covered with deep excoriations or ulcers. Both tonsils were enlarged into purplish masses, the left one being a large tumor extending beyond the median line nearly to the opposite tonsil and well up into the rhinopharynx. On its anterior surface there was a necrotic spot

one-half inch in diameter, with a perforation through which exuded a dark-brownish, grumous discharge; on its inner surface was a similar spot. On excising the tonsil a dry, stringy or fibrous, gangrenous mass presented at once, indicating that the whole interior was necrosed. A rounded, fetid mass, about the size of a hickory nut, was removed with the forceps, much as a nut could be picked from its shell. The gangrenous process continued the following day, when more necrosed tissue was cut away, and pure nitric acid was applied, which seemed to stop further advance of gangrene, and the patient made a rapid recovery. The soft palate remained drawn considerably to the left side and backward without interfering with deglutition and phonation.

Lingual Tumors.—At a recent meeting of the Laryngological, Rhinological, and Otological Society of Paris, DR. DIDSBURY reported (*Annales des Mal. de l'Oreille, du Larynx, etc.*, vol. xxvi., No. 1) a case of large tumors at the base of the tongue in a woman, aged fifty years, which had penetrated so deeply and freely into the larynx as to interfere seriously with respiration. They were removed with the wire snare; of course, with immediate relief to the patient. Histological examination failed to reveal the true nature of the tumors, which were supposed to be non-demonstrably tuberculous.

Tuberculosis of the Larynx.—PROF. G. FERBERI, of Rome, contributes to the *Annales des Mal. de l'Oreille, du Larynx, etc.*, vol. xxvi., No. 1, an article upon tuberculosis of the upper air passages, in which he gives reasons for discarding topical treatment with lactic acid and the like, and recurs to the almost abandoned treatment by applications of ethereal solutions of iodoform, applied after scraping away any exuberant tissues with a pocket-shaped scoop, which catches the fragments and prevents them from falling back into the air passages.

Acute Enlargement of the Thyroid Gland.—PROF. ALFRED STENGEL, of Philadelphia, contributes an article on acute enlargements of the thyroid gland, with reports of cases (*University Medical Magazine*, June, 1900), and refers especially to a form occurring in certain kinds of anæmia, especially chlorosis, the degree of enlargement being more pronounced, as a rule, in anæmias following hemorrhage than in chlorosis, and the associated symptoms being likely to render the differential diagnosis from Graves' disease rather difficult in some cases.

In recapitulating his observations the writer calls attention to the facts that sudden enlargements of the normal thyroid gland may occur in consequence of nervous excitements of various sorts; as the result of intoxication and various infections; at the onset or in the course of exophthalmic goitre; and sometimes in cases of ordinary goitre or of malignant disease, and that when the pre-existing disease of the thyroid gland is slight the sudden enlargement may give the case an appearance of an entirely acute disease, the underlying chronic condition being overlooked.

Diabetic Ulcers in the Pharynx and Larynx.—DR. W. FREUDENTHAL, of New York, in a contribution to the fourth volume of Bresgen's mono-

graphs on *Nose, Ear, and Throat Diseases*, narrates a number of cases of his own practice, and divides them into two categories: One malignant, in which treatment is of no service, and death takes place by inanition from inability to swallow food; the other benign, in which the tendency is to recover, and in some instances even without topical treatment. Among the latter cases, however, he narrates one in a man, aged seventy years, almost dying in consequence of his dysphagia, and in whom recovery followed protracted daily treatment with an orthoform emulsion without any internal medication whatever.

Laryngectomy.—DR. N. TAPTAS, of Constantinople, reports (*Annales des Mal. de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1) a case of total laryngectomy for sarcoma of the larynx, in which he applied an external artificial larynx of his own device, the details of which are illustrated. The result was very satisfactory, the patient being able to emit sound; but, unfortunately, a recurrence threatened to carry off the patient at no distant date. Meanwhile the patient was able to swallow without any food or saliva penetrating into the tracheal portion of the canula.

Death from Hemorrhage After Excision of Adenoids.—DR. RICHARD SACHS, of Hamburg, reports (*Journal of Laryngology, Rhinology, and Otology*, February, 1900) a case in which he excised a pharyngeal tonsil, the size of a walnut, from the pharynx of a boy ten years of age. Severe hemorrhage occurred a few hours later, and the patient died four days after the operation despite all that could be done. During the treatment it was found that the patient was a hæmophile, and had bled some four days six months previously after the removal of a tooth.

Abscess on the Anterior Surface of the Epiglottis.—DR. ALEXANDER C. HOWE, of Brooklyn, reports (*New York Medical Journal*, October 28, 1899) this case in the person of a young male laborer, twenty-four years of age, who gave no other history than that of having been subject to slight sore-throats during cold weather. The tumor was incised and nearly a drachm of foul-smelling yellow pus was discharged, relieving the dyspnoea at once. Probing indicated that the cartilage was somewhat destroyed, though not perforated.

Phonation.—DR. ONODI refers (*Revue Hebd. de Laryngologie*, etc., August 12; *Journal of the American Medical Association*, September 16, 1899) to a study of a number of monsters and of fetuses whose skulls had been perforated, but who had used their voices, which confirms the existence in man of an infracerebral centre of phonation the same as he had already established for dogs, and in the same spot—that is, between the posterior quadrigeminal tubercles and the domain of the vagus.

Stenosis of the Trachea.—A. DÖRNER reports (*Philadelphia Medical Journal*, October 21, 1899; *Wien. klin. Wochenschrift*, 12 Jahrg., No. 23) a case of tracheal stenosis, due to pressure of an aortic aneurism, in a female subject. Tracheotomy became necessary, and it was immediately followed

by difficulty in breathing, which was relieved by the passage of a soft catheter down to the bifurcation of the trachea. The patient was unable to breathe if this was removed, so a canula was constructed having a soft rubber extension that reached to the bifurcation. The patient died a little over a year after the tracheotomy from inspiration of blood into the lungs after a slight rupture of the aneurism.

Sarcoma of the Carotid Sheath.—DRS. SCANES SPICER and STANSFIELD COLLIER report (*Lancet*, August 5, 1899; *Philadelphia Medical Journal*, August 26, 1899) a case of hoarseness and difficulty of breathing in a man, aged fifty-nine years, with a lump in his neck resembling a mass of enlarged, matted glands, the manipulation of which instantly produced coughing. Laryngoscopic inspection revealed the left vocal band to be motionless in the cadaveric condition. At the operation the growth appeared to be limited to the carotid sheath, and surrounded the contained structures. Ligatures were placed upon the internal jugular vein and the carotid, and these vessels, with the pneumogastric nerve, were divided on the thoracic side of the tumor. The growth was readily separated from the surrounding structures, the artery and vein were next ligated at the level of the hyoid bone, and the tumor, with the involved structures, was removed. Until the cephalic side of the growth was interfered with there was no respiratory disturbances, and then breathing became shallow and infrequent, and respiration ceased as the vagus nerve was being isolated. Artificial respiration was resorted to for two minutes. The patient was much collapsed at the close of the operation, but he rallied and made an uneventful recovery.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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On the Source of the Fibrin and the Origin of the Adhesions in Acute Adhesive Inflammation of Serous Surfaces.—HEINZ (*Virchow's Archiv*, 1900, clx., 365) discusses the more or less diametrically opposed views held at present in regard to the source of the fibrin on serous surfaces, and offers in favor of one of them the results of a very careful study of experimental lesions produced in rabbits.

Naumann and Grawitz believe that the fibrinous layer arises from a swelling and fibrinoid degeneration of the upper surface of the serosa, while Marchand and Ziegler teach that it is due to a fibrinous coagulation of an

exudation of plasma from the superficial bloodvessels. The first view is based on the following grounds :

1. If the fibrin membrane arises from a fibrinous exudation from the vessels, then the serosa epithelium should be beneath it. Some writers claim, on the one hand, that it has disappeared from beneath the membrane, while Neumann describes cases in which the outer surface of the fibrin layer was covered with serosa epithelium—a condition to be explained, he thinks, only by assuming a fibrinoid degeneration of the serosa tissue.

2. Special stains (picrocarmin), according to Neumann, show transitions of connective tissue into fibrin.

3. A fibrin membrane arising from a fibrinous exudation should contain besides fibres and network of fibrin only leucocytes and possibly red blood globules. But, according to Grawitz, fresh examination of the membrane shows also serosa epithelium and connective-tissue cells, the latter of which, according to him, could be found only in fibrinoid degenerated connective tissue.

In order to excite a fibrinous exudation in serous cavities Heinz injected a solution of iodine in iodide of sodium into the pleural and peritoneal cavities of rabbits, and studied the lesions produced after various intervals of time. His results are as follows :

In the pleural cavity a definite layer of fibrin due to exudation of plasma from the vessels is formed by coagulation on the surface of the serosa, from which it is very sharply marked off.

The pleural epithelium is usually destroyed by the action of the iodine, but in places it is left intact beneath the fibrin on the surface of the serosa ; less often small patches of epithelium have been lifted off by the exudation and lie on top of the fibrin.

The exudation in passing from the vessels in the lung to the pleural cavity may coagulate in the tissues (impregnate them), and thus give rise to an apparent fibrinoid degeneration of the connective tissue.

Occasionally bits of connective and elastic tissue can be found in the fibrin membrane. Examination of the pleural exudation and of the lung show that they are due to the iodine, causing in places a superficial loss of substance, which later is followed by active repair.

The injection of iodine into the peritoneal cavity causes an exudation of fibrin and extensive adhesions of the intestines. The fibrin is most abundant along the lines of contact of the coils of intestine. Beneath the fibrin the serosa tissue presents a peculiar hyaline appearance, which is considered by Borst to be due to fibrinoid degeneration, but is held by Ziegler and the writer to be due to hyaline degeneration.

The coils of intestine are stuck together first by fibrin, later by connective tissue. The serosa epithelium (endothelium) protects serous surfaces from adhesions ; the latter form only where the endothelium has been destroyed.

Tumors of the Dura Mater.—ENGERT (*Virchow's Archiv*, 1900, clx., 19) suggests a common histogenesis of all psammomata from the superficial endothelium of the dura mater. He examined the inner surface of the dura at autopsy for the presence of tumors, with a positive result in every fifth or sixth case. In this way he collected twenty-five tumors. They appeared to

occur most frequently in the region of the convexity of the brain, varying in size from a pin-head to a bean.

In structure they varied from fibromata to very cellular sarcoma-like forms. The calcifications he attributes to a grouping of the cells about the bloodvessels and subsequent calcification. To explain cases where no remains of the bloodvessels are found in the centre of the calcification he suggests that it may have been formed about the bud of a vessel which has not yet developed a lumen. In support of his views, however, he gives very little histological evidence.

The Finer Changes in the Walls of Varicose Veins.—JANNI (*Archiv für klinische Chirurgie*, 1900, lxi., 12) observed not only degenerative changes brought about by the distention of the veins, but also a new formation of connective tissue which was sometimes quite marked. This new growth of connective tissue occurred chiefly in the intima, giving rise to an endophlebitis characterized by the formation of nodules or flat areas of thickening.

In these endophlebitic growths there was a breaking down of the internal limiting membrane into thinner elastic sheets and fibres. This destruction of the inner elastic limiting membrane is easily demonstrable, and is associated, particularly in the large nodules, with a new formation of elastic tissue which is sometimes abundant.

In the inner portion of the media there was often a new formation of connective tissue limited to those places where the nodules or plates had formed.

Janni asserts that the endophlebitis is the primary change in the vessel wall. He does not regard it as compensatory in character, as Epstein maintains.

Psammoma.—VIRCHOW (*Virchow's Archiv*, 1900, clx., 32) calls attention to the confusion that has arisen in the use of the term psammoma since his introduction of the word in 1863. His classification of the diseases of the brain associated with "sand-formation" he believes is still sufficiently clear to prevent misunderstanding. Quoting from his original description, he says: "Only those tumors in which the sand-like masses are analogous to those occurring normally in the brains of adults are included. Among these one may distinguish two classes. The sand is either in the interior of connective-tissue bundles or it lies more loosely in and between the parts, so that the individual granules may be isolated easily."

He distinctly excluded the calcified endotheliomata and other processes associated with calcification, to which the term has been so frequently applied.

A Contribution to our Knowledge of the Etiology of Tumors.—SCHÜLLER (*Centralblatt für Bakteriologie*, 1900, xxvii., 511).

The article is preliminary to a more detailed report, with illustrations shortly to appear.

The author within the past five months has examined numerous carcinomata and sarcomata taken from various parts of the body, and claims to have demonstrated in every case an organism which he believes to be con-

cerned in the etiology of tumors. These organisms in cultures he describes as round or oval vesicular bodies, when fully developed three or four times the size of a red blood-corpuscle. They consist of a thick refractive capsule with dark-brown contents. The capsule has a radiating, striated appearance, which the writer believes is due to "small openings" or "pores." The organism in culture varies in size, the smaller being the younger forms. It may occur singly or in groups or heaps. In places the contents can be seen escaping from the capsule, and clumps of empty capsules are frequently found. In living hanging-drop preparations flagella-like processes are distinctly recognized. In dead preparations these are withdrawn. The organism is never motile. All these forms can be demonstrated in the fresh tissue. Stained specimens are of little value. A small bit of tissue preserved in alcohol is teased out in absolute alcohol on a slide and cleared with lavender oil. The organisms are frequently found in masses, and are easily recognizable on account of their color and form. Sometimes they occur between the cells, sometimes within cells, often distending them greatly.

Cultures are made from rapidly growing portions of the tumor and never from degenerated areas. Cultures taken from tumors with superficial ulceration are as a rule unsuccessful. Washing the excised tissue in corrosive sublimate has a bad effect. The tumor tissue itself is used as a culture media, though the author is not satisfied with this method. The tissue is put in a sterile glass vessel and kept in the dark at body temperature.

In successful cultures within a few days small pearl, gray or yellowish translucent droplets appear which microscopically are seen to be composed of these organisms.

The author has made some animal inoculations, but not enough time has yet elapsed to complete these observations.

[This report is in line with many others on the subject of the etiology of carcinoma. The writer finds something which he cannot explain, immediately jumps to the conclusion that it is the cause of carcinoma, and rushes into print without waiting until experimentation has proved the truth or falsity of his conclusions. The only excuse for reviewing such an article is that it may contain a grain of truth.—ED.]

A New Stain for Neuroglia Fibres.—YAMAGIWA (*Virchow's Archiv*, 1900, clx., 358) gives the following method, based on Stroebe's stain for axis-cylinders:

1. Harden very thin pieces of fresh tissue in Müller's fluid for about one month, changing the solution daily during the first week.
2. Transfer directly to absolute alcohol for several days to a week.
3. Embed in celloidin.
4. Stain the sections in a saturated alcoholic solution of eosin for twelve hours or longer.
5. Transfer to a concentrated aqueous solution of aniline blue for four to six hours.
6. Differentiate in dilute alcohol made slightly alkaline by the addition of a few drops of a 1 per cent. solution of caustic potash. (The deep-blue sections become at once or gradually reddish-brown, according to the alkalinity of the alcohol.)

7. Wash out the alkaline alcohol in water.
8. Remove the excess of aniline blue in dilute alcohol. (The sections show a reddish color.)
9. Dehydrate in absolute alcohol.
10. Clear in oleum origani cretici.
11. Xylol balsam.

The axis-cylinders stain deep blue, the neuroglia fibres and the red blood-globules dark red, myelin sheaths light red, the protoplasm of neuroglia cells pale violet or bluish-red, the cell body of the ganglion cells pale bluish-gray, connective tissue fibres, adventitia, and the intima of bloodvessels sky blue to pale green, the nuclear membrane of all cells blue, the nucleoli deep violet to deep blue.

The method succeeds only with fresh tissue cut into very thin slices and properly hardened. Tissue left in alcohol too long refuses to hold the eosin stain.

Yamagiwa concludes from the study of his sections that the neuroglia cells in the developed nervous system offer points of support for the neuroglia fibres which are nothing else than the differentiated, peripheral parts of the neuroglia cells whose cell body is not sharply circumscribed by a special membrane; in other words, the neuroglia fibres represent a differentiated intercellular substance, which, however, is not entirely or not everywhere separated from the cells.

A Method of Staining Gonococci.—HOMBERGER (*Centralblatt für Bakteriologie*, 1900, xxvii., 533).

A preparation of gonorrhoeal pus stained with kresylecht-violet, in an aqueous solution of 1 to 10,000, stains the nuclei a weak blue, and the gonococci red violet. Other bacteria stain only lightly or not at all.

For staining the organism in sections the author uses a 1 per cent. solution, stains a few minutes, transfers to alcohol, then to aniline-oil-xylol 2 to 1. Kresylecht-violet is very slightly soluble in alcohol, so that there is little danger of decolorizing too much. He also recommends this stain for amyloid, mast cells, blood, and the plasmodia of malaria.

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PRIMARY SPLENOMEGALY—ENDOTHELIAL HYPERPLASIA OF
THE SPLEEN—TWO CASES IN CHILDREN—AUTOPSY AND
MORPHOLOGICAL EXAMINATION IN ONE.¹

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THE cases herein reported represent, in the writer's belief, an affection hitherto unrecognized. But two complete reports of similar cases are to be found in literature, and in both of these it can be clearly shown that the pathological findings were wrongly interpreted. The cases were of such interest that they were kept under observation for a period of nearly three years, during which time no definite conclusion as to the nature of the affection present could be reached.

It was only the light afforded by the autopsy and subsequent morphological examination in one of the cases that made clear the nature of the morbid process.

The histories are as follows:

The children were first seen in November, 1896, and were referred to the Presbyterian Hospital, where the following observations were made:

CASE I.—M. K., aged three years. (See Fig. 1.) Clinical record only.

Family History. Father and mother both living and well. Mother has borne ten children, of whom one was still-born at eight months, four died during infancy from "summer complaint," and five are living.

¹ Awarded the Alumni Association Prize of the College of Physicians and Surgeons (Columbia University), 1900.

Of the living, three boys, aged respectively eleven years, eight years, and five years, are healthy and vigorous, presenting no traces of disease. The patient and her sister, described below as Case II., are the only invalid members of the family. It is to be noted that the boys stand in age between the sisters. The deaths in infancy above recorded were not successive, but occurred between the births of children that survived. The mother is free from any traces of disease. The father was not seen, but was reported perfectly well.

Previous History. The only ailment has been occasional attacks of toothache, with some swelling of the right side of neck.

FIG. 1.

CASE I. M. K., aged three years.

Dotted lines indicate margins of liver and spleen.

Present Illness. For about one year the mother has noticed that this child's abdomen has been growing prominent, the enlargement steadily increasing. She has also observed that there was a hard mass on the right side of the abdomen, as well as upon the left. Otherwise the child has been quite well. No chills or fever; no headache; no sore throat; no swelling of the feet; no disease of skin or bones. For three weeks she has had a slight cough, but has not been sick with it. The appetite is good, the bowels regular. On admission to hospital: temperature, 99.8° ; pulse, 108; respiration, 36. Urine, sp. gr., 1031; acid, trace of albumin; leucocytes, but no casts.

Physical Examination. Child is of normal stature, well nourished, and not anæmic; the skin is rather dusky; tongue moist and clean, the teeth normal. Lungs: Over the whole right lung abundant sibilant and sonorous, fine and coarse mucous râles. Over the left, a few râles of similar character; otherwise normal. Heart: Apex in fourth space, three inches from median line. Sounds and action normal. Liver dullness extends from fourth space to three inches below free border of ribs in midclavicular line, where edge can be distinctly felt; edge is moderately hard and sharp. Spleen: Emerges from beneath ribs in midclavicular line, extends downward and inward to within half an inch of median line at umbilicus, the lower end being on a level with the anterior superior spine of the ilium. The edge is sharp and hard; the notch in anterior margin is felt one inch below the costal margin. Abdomen is otherwise normal. Extremities normal. Superficial lymph nodes: In each axilla one node, size of a bean, can be felt. Both sets of inguinal nodes are slightly enlarged. The nodes are not painful or tender, and are freely movable. Tonsils, both much enlarged.

Examination of Blood. Red cells, 4,400,000; white cells, 9000; hæmoglobin, 75 per cent. No malarial organisms. During her stay in hospital, from November 28, 1896, to December 22, 1896, the child seemed quite well. The chest signs cleared up and the cough ceased. She gained one and three-quarters pounds in weight; weighed thirty-two and three-quarters pounds at discharge. Throughout her stay Fowler's solution was given in increasing doses until she was getting fourteen minims per day.

The physical examination at discharge, with the exception of the signs of bronchitis, was as above given. This child was also seen on March 30, 1897. At that time the liver was as already described. The spleen had apparently increased somewhat in size, as it then reached the median line and extended some distance (about an inch and a half) below the umbilicus. Otherwise the child was perfectly well and happy. An examination of the blood gave: Red blood-cells, 4,800,000; hæmoglobin, 65 per cent. The white cells were not counted, but studied in stained smears they showed no relative increase and no abnormalities in form. The red cells were also normal in form.

July 26, 1899. For some time, the mother says, the child had been failing. Her appetite has remained good. She eats a great deal of meat, and eggs, and sugar, drinks much coffee, but will hardly touch vegetables. The bowels are constipated. Her nose bleeds frequently and very freely. She always has a cough; never vomits; has lost flesh very decidedly. During the past summer her face and hands have become bronzed.

Examination at this time, aged six years, four years after onset. Across the bridge of the nose and on cheeks and hands there is a diffuse bronzing of the skin, similar to that observed in her sister, Case II. The color of the mucous membranes is good; the tongue is normal; the teeth are decayed; the gums normal; the lungs and heart are normal. The abdomen looks much more prominent than when first seen; measures twenty-three and one quarter inches at umbilicus. The superficial veins of the abdomen are engorged. The liver extends from the sixth rib in the axillary line to within an inch and a half of the umbilical line. The left lobe is apparently the more enlarged, filling the whole epigastrium. There has evidently been some prolapse of the organ since the

last examination. The spleen now extends into and fills the right iliac fossa. Between the enlarged liver and spleen there is a narrow space about two inches in width, which is not occupied by the solid viscera. The extremities have lost their full, round appearance, and are now thin. The inguinal, axillary, and cervical lymph nodes are all slightly enlarged, but feel soft rather than hard.

The examination of the blood at this time showed: Red cells, 4,180,000; white cells, 14,000; hæmoglobin, 62 per cent. A differential count of the white cells showed: Polynuclears 57.5 per cent., normal 62-70 per cent.; mononuclears, large, 29 per cent., normal 4-8 per cent.; small

FIG. 2.

CASE II. D. K., aged thirteen years.

Dotted line indicates anterior margin of spleen.

12.5 per cent., normal 35 per cent.; eosinophiles 1 per cent., normal $\frac{1}{2}$ -4 per cent.

A recent note from the mother (December, 1899) states that the child has not improved in any way, but is still able to attend school.

CASE II.—D. K., aged thirteen years. (See Fig 2.) Clinical record, with autopsy, etc.

Family History. As above.

Previous Personal History. At five years of age child had measles; at seven an eruption, limited to the scalp, and consisting of large areas covered by scabs, which lasted three or four months. No chills or

fever; no headache; no sore throat; no cough; no vomiting; no swelling of the feet. No other illness beyond that to be recorded.

Present Illness. When she was about three years old her mother noticed that the abdomen was getting larger than normal, and since that time there has been a progressive increase in its size. Soon after noting the protuberance of the abdomen the mother found that there was a hard mass in the left side, and has observed that this mass has increased in size with the swelling of the abdomen. The mother has also noted the brownish pigmentation of the skin, especially across the nose, and has thought that the extremities have become thinner of late. The child has complained of little discomfort from the enlarged abdomen, has been a little short of breath, but otherwise has been quite well. The appetite is good, the bowels regular.

On Admission to Hospital. Temperature, 99.8°; pulse, 96; respiration, 24.

Urine. Specific gravity, 1024, 2 per cent. albumin, moderate number of granular and epithelial casts and leucocytes.

Physical Examination. Child is rather small in stature for her years; is fairly nourished. The skin generally is rather dusky, and across the nose and underneath the eyes and upon the upper lip there is a decided brownish pigmentation. She lies from choice upon the left side. Tongue is moist and clean; teeth normal. Heart: Apex in fourth space, two and a half inches from median line; action regular and of good force; no murmurs. Lungs: Apparently normal; no signs of compression. Liver: Dulness extends from fifth space to free margin of the ribs; edge cannot be felt. Abdomen: Protuberant, girth at umbilicus thirty-one and a quarter inches; superficial veins somewhat dilated. Three-quarters of an inch to the left of the median line there emerges from beneath the ribs a solid mass, with a firm, rounded edge which extends downward in the median line to a point about one inch above the umbilicus, and thence passes obliquely across to the right anterior superior spine of the ilium. The mass, therefore, fills the whole of the left side of the abdomen and most of the lower half of the right side. Just above the umbilicus there is a deep notch in the border of the mass, in which a finger can easily be laid. The mass feels hard and smooth; is not tender; in every way presents the characters of an enlarged spleen. Extremities are normal. Superficial lymph nodes; slight enlargement of right inguinal; moderate enlargement of both submaxillaries; one palpable node in each axilla; no enlargement of the epitrochlear nodes. Tonsils: Both moderately enlarged.

An examination of the blood showed: Red blood-cells, 2,880,000; white cells 4000; hæmoglobin, 60 per cent. No malarial organisms.

During her stay at the hospital, from November 28, 1896, to December 22, 1896, the child was up and about, playing naturally with the other children. There was occasionally slight constipation, easily relieved. Later examination of the urine showed a specific gravity of 1030, an acid reaction, only a trace of albumin, and no casts. Voided about twenty-four ounces per day. While in the hospital she was given Fowler's solution in gradually increased doses, until at time of discharge she was taking eighteen minims per day.

The physical examination made just previous to discharge corresponded exactly to that above recorded. There was no change in the viscera. Temperature was normal throughout her stay in hospital.

Weighed seventy pounds at discharge, a gain of four and three-quarter pounds.

After spending four months at home, the patient was seen on March 30, 1897, and again examined. The splenic enlargement was practically unchanged. The mother reported that since leaving the hospital the general health has been good; that, although somewhat short of breath, the child had attended school, and had been cheerful and happy.

The examination of the blood at this time showed: Red cells, 2,800,000; hæmoglobin, 45 per cent. The white cells were not counted, but studied in stained smears. They showed no relative increase in number and no abnormalities of form. The red cells were also normal in form.

In the interval since leaving the hospital specific treatment, both in the form of inunctions of blue ointment and the internal administration of the bichloride of mercury and potassium iodide had been tried without effect.

The condition of this child remained practically the same. She did not grow in stature or gain in weight. The mental condition after three years (at the age of sixteen years) was that of a child. The possibilities of medical treatment having been exhausted without any relief, the mother asked to have an operation undertaken, as it was evident that the child was slowly but surely going down under the influence of her disease. She was admitted to the hospital May 15, 1899.

Examination at the age of sixteen years, thirteen years after onset. Child fairly well-nourished. Face and hands deeply bronzed, in a manner somewhat similar to that seen in Addison's disease. Tongue, clean. Lungs, normal. Heart, systolic murmur over the pulmonary area. Liver, dulness begins at the sixth rib, edge felt one and one-half inch below free margin of ribs. Abdomen is greatly distended, measures thirty-two inches at most prominent part. Many large veins course over it and even extend upward on to the chest. Lower costal margins are prominent and everted. From beneath the left arch emerges a hard mass which fills the whole left side of the abdomen and the right iliac fossa. The mass is hard all over, the surface is smooth, the edges are round. The right side of the abdomen and the left flank are tympanitic. The left lobe of the liver can be felt in the epigastrium, deflected to right of median line. The extremities were slender and poorly developed.

An examination of the blood gave the following result: Red blood-cells, 3,550,000; White blood cells, 7000.

Differential count of white cells: Lymphocytes, large, 15 per cent., normal, 4-8 per cent.; small, 21 per cent., normal, 35 per cent.; polymorphonuclear, 62 per cent., normal, 62-70 per cent; eosinophiles, 1.4 per cent., normal, $\frac{1}{2}$ -4 per cent.

Splenectomy was done on May 17, 1899, by Dr. A. J. McCosh. The patient died three hours after the operation.

Autopsy twenty-four hours post-mortem. Frame, small; adipose, scant; muscle, good. Diaphragm: right side, third rib; left side, fourth rib. Heart: weight, six and one-half ounces. Pericardium, normal; valves, normal. Muscle, anæmic. Lungs: Left; pleura, some loose adhesions; section, tissue firm and tough, looks normal. Right; pleura, adhesions more extensive than on left; section, same as left. Weight, nine and one-half ounces. Peritoneum: Contains 200 c.c. bloody fluid. Mesenteric lymph nodes enlarged, very pale and flabby. Gall-bladder, full of brownish bile. Liver: Consistence, firm; surface, smooth over greater

part, much wrinkled at extreme right; section, chocolate colored; many little white spots like connective tissue, most abundant in wrinkled portion of right lobe. Weight, sixty-eight ounces. Pancreas, normal. Kidneys: Left; adrenal, flattened, but large; ureter, normal; capsule, free; consistence, firm; surface, smooth, flattened against vertebral column; section, straight tubules seem to be generally dilated, so that Malpighian bodies seem to be made up of little cysts; markings of cortex, indistinct. Weight, four ounces. Right, normal in appearance. Weight, five ounces. Stomach, normal. Intestines, normal. Pelvic organs, uterus, infantile. Brain: Tissue very fine; middle commissure, white and tough; two sections made longitudinally through it without severing it. Weight, forty-six ounces. Spleen: This organ was examined both immediately after its removal at the operation and later when hardened in 4 per cent. formalin. Weight, immediately after removal, while still full of blood, twelve and one-half pounds. Total weight of child not more than seventy-five pounds. Form, in general, that of normal spleen. Surfaces: topographically, these correspond to normal spleen, but are, of course, much larger. Upon the external surface are the remains of many fibrous adhesions, which had been divided at the operation. In color, most of the surface is white or yellowish-white, like dense fibrous tissue. Only on the internal aspect and at the postero-inferior portion of the external surface does the color of normal spleen appear. In general the surface is smooth. On the anterior margin there is a deep notch at the junction of the lower with the middle third. Upon section the abnormalities in color are seen to be due to thickening of the fibrous coat, which is in many parts from 2 to 4 mm. in thickness. Where the color of the surface is normal the fibrous coat is normal or only slightly thickened.

The substance of the spleen is unusually firm and resistant. The appearance of the cut section varies in different parts. A central longitudinal section shows numerous very firm white or yellowish-white areas, in general, though very irregularly, of pyramidal form, extending from the surface deeply into the substance of the organ. On such a cut these areas occupy the larger part of the surface exposed. The remainder of the surface has the appearance of normal spleen. These changed areas extend inward about one-half the depth of the organ. Toward the anterior margin nearly the whole section has this appearance, while the normal splenic appearance predominates posteriorly and also about the hilus. In the hardened state the spleen measured from above downward 34.5 c.m., from behind forward 20 c.m., from without inward 11 c.m.

The lymph nodes immediately at the hilus of the spleen are enlarged, soft, and upon section the central parts are deep red, the periphery pale. The enlargement is insignificant in comparison with that of the spleen. Most of the nodes appear somewhat flattened by pressure. Some of the largest measure 2 c.m. in length, 1.25 c.m. in width, and 1 c.m. in thickness.

Microscopical Examination. The tissues were hardened in alcohol or formalin and alcohol, embedded in paraffin or celloidin, and sections stained with hæmatoxylin and eosin.

Corresponding with the variations in the gross appearance of the spleen the sections show marked morphological differences. Sections from the hard white areas are very different from those taken from the parts having the appearance of normal splenic tissue. The latter present a

very unusual picture. In its clearest form this consists of large, irregular, round, oval, or polyhedral spaces, more or less filled with large, brightly stained cells. (See Fig. 3.) The size of the spaces varies greatly. The largest measure 0.300 mm. by 0.375 mm.; the smallest, 0.075 mm. by 0.060 mm.; the average seem to be about 0.195 mm. by 0.225 mm.

The walls of these spaces, as seen in cross-section, consist in some parts of a delicate line of connective tissue with infrequent, small, oval nuclei. Frequently adjoining spaces communicate with one another by narrow

FIG. 3.

Section of spleen $\times 800$ and reduced.

A. Pulp space filled with endothelial cells. B. Space containing few endothelial cells; centre filled with blood. C. Connective tissue. D. Cells showing pale areas within them.

passages. In most places the walls of the spaces are much thicker. Sometimes the thickened wall consists of simple connective tissue, but where the thickening is most marked the wall is largely made up of a mesh of fine capillaries, the endothelium of which consists of cells having deeply staining round nuclei and a small cell body closely resembling lymphoid cells. The cells within the spaces present a striking appearance. They are very large, as a rule, and of varied shape. Many of them, lying free in the spaces, are round and oval, but where they are closely packed together the form varies greatly. An average cell measures 0.0208 mm. by 0.0260 mm.; the largest, 0.0572 mm. by 0.039 mm.;

the smallest, 0.0130 mm. by 0.0104 mm., little larger than a leucocyte. The nuclei vary considerably in shape and size. As a rule, they are very small in proportion to the size of the cell, measuring 0.0078 mm. by 0.0052 mm., or 0.0130 mm. by 0.0052 mm. Many of the cells show none at all, but from the disproportion between the size of the cells and that of the nuclei it seems probable that, signs of degeneration being absent, in these cases the section had by chance missed the nucleus, though cutting the body of the cell. The nuclei also vary greatly in

FIG. 4.

Microphotograph of section of spleen.
Same area as Fig. 1. Magnification about 190.

their staining capacities, some of them staining faintly, some deeply with the hæmatoxylin. Many of the cells show two or three nuclei. Some of the nuclei show mitotic changes, others show nucleoli. The cell bodies also vary in their staining. As a rule, they have taken the eosin deeply, but some stain very faintly. Apart from the staining the appearance of the cell bodies varies. Many of the bodies present a finely granular appearance, some are lightly streaked, while others show one or more round, oval, or irregular areas, which are distinctly lighter and clearer than

the remainder of the cell body, yet are not altogether colorless. In some cases there is only one small area of this kind in a large cell body, in others one or several such areas occupy almost the whole of the cell body.

Many of the cells above described lie free in the spaces. In favorable places, however, it can be plainly seen that many of them are directly attached to or spring from the walls of the spaces in which they lie.

FIG. 5.

—B

A

Section of spleen $\times 800$ and reduced.

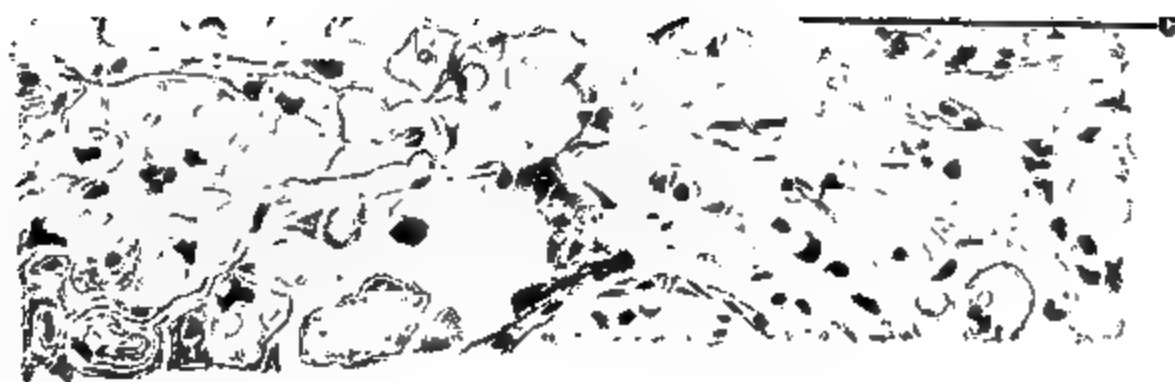
A. Endothelial cells fusing together. B. Giant cell. C. Large vein lined by swollen endothelium.

The number of cells in a space varies in different parts. In some places there are only a few lining the walls or lying free in the centre of the space. In such cases the remainder of the space is filled with blood. In other parts the cells are seen to completely fill the spaces. Careful study leaves no doubt that these spaces are the pulp spaces of the spleen and that the cells that fill them have sprung from their walls. The normal pulp cells have disappeared. On the other hand, Malpighian bodies are met with in the sections almost unchanged. (See Fig. 8.)

From sections showing only partly filled spaces we can pass to others in which these large cells fill and even distend the spaces. In these cases many of the cell bodies apparently fuse together, for we see large, irregular sheets of protoplasm containing many nuclei. (See Fig. 5.) There are also in some places giant cells.

In contrast with these areas, there are parts in which the spaces are apparently lessened in size by the growth of the walls about them.

FIG. 6.

Section of spleen $\times 800$ and reduced

A. Pulp space filled with endothelial cells. B. Delicate connective tissue stroma. C. Area where cells and stroma merge.

The connective tissue structure in some places is so abundant that the spaces can contain but a single cell. In other parts there are large cells, of the type described above, lying in the midst of a fine fibrillated stroma which closely invests them, and with which the cells mingle in such a way that their bodies can no longer be distinguished from the stroma in which they lie. (See Fig. 6.) In studying these areas one is almost

driven to the conclusion that the large cells are being transformed into connective tissue. Such areas we find on the border zone between the firm white portions and the parts having the appearance of normal spleen.

Sections from the midst of the firm white areas of the organ consist of more or less dense connective tissue. In parts this is infiltrated with small round cells, in other parts it seems to be made up of a mesh-work of capillaries, but without the swollen endothelium seen in the walls of the pulp spaces. Many of these areas have the appearance of oedematous connective tissue.

The capsule of the spleen and the trabeculae are greatly thickened. The bloodvessels are regularly surrounded by a greatly increased quantity of connective tissue. The Malpighian bodies are not much altered.

FIG. 7.

Section of lymph node $\times 800$ and reduced.

- A. Thickened capsule. B. Endothelial cells in lymph-sinus C. Pigment in lymph-sinus.
D. Delicate reticulum, spaces filled with endothelial cells.

In some places the changes in the pulp seem to encroach upon the bodies. Sometimes the periphery of one of the bodies contains an unusual number of small capillaries. In general, however, they seem very little affected by the great changes that have gone on about them. Sections of the spleen were stained with methylene-blue and carefully examined for bacteria, but none were found.

The lymph nodes immediately in relation to the spleen show very interesting changes. In the gross they are swollen, but rather soft. On section the centre of the node is deep red, the periphery pale; sections present a beautiful microscopic picture. (See Fig. 7.) Each follicle is outlined by a wall of brightly shining, rather dark pigment, which closer inspection shows to be deposited in the inner part of the lymph-sinus surrounding the medullary portion of the follicle. In some places

the pigment quite fills the sinus. The wall of pigment is almost continuous about the follicle. The part of the lymph-sinus not occupied by pigment is seen to be nearly completely filled by cells. A few of these are normal lymphoid cells. The greater number are large round, spindle-shaped, or polygonal cells with large round or oval nuclei.

Both the nuclei and the cell bodies stain rather faintly. In parts where the number of these cells is small they may be seen to spring

FIG. 8.

Section of spleen from a case of chronic empyema. Simple dilatation of cavernous veins or pulp spaces. $\times 480$.

A. Malpighian body. B, C. Dilated spaces. D. Connective tissue septa.

from the walls of the reticular tissue of the lymph-sinus. When there are many of these cells packed together this relation is obscured.

Throughout the node the medullary portion of the follicle has undergone remarkable changes. From a greater or less part of the medulla, usually a segment of the periphery, the lymph cells have almost com-

pletely disappeared. In the transformed areas the reticular substructure is plainly seen, with here and there one of the branching cells of which it is made up. Within the irregular spaces of this network lie large cells, one cell usually filling a compartment, though in some cases several may be seen in one space. These cells stain very faintly. They are round or polygonal. The nuclei are of fair size, round, oval, or irregular, and stain feebly.

FIG. 9.

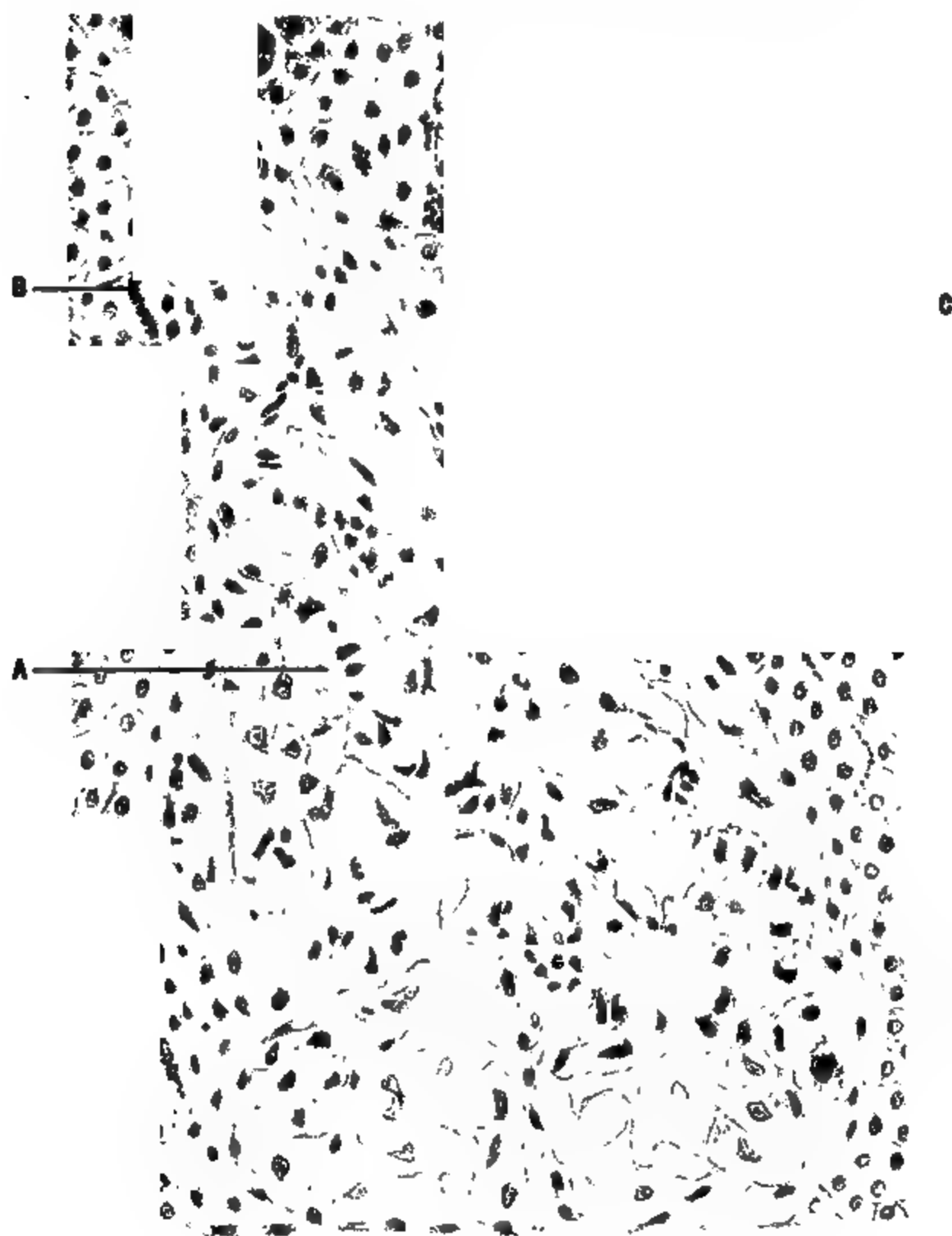
Section of spleen. Splenomegaly. $\times 480$.

A. Malpighian body. B, C. Dilated spaces filled with endothelial cells. D. Connective tissue septa.

Some of the cells show paler areas within them just as described in the cells of the spleen. The whole follicle may have undergone these changes. Usually a part of the follicle presents a normal appearance. The transition from the changed almost colorless zone to the darker part filled by the lymphoid cells is abrupt. The lymphoid cells are nor-

mal in form and arrangement. Here and there through them a large light colored cell may appear, or the normal reticulum may be seen. A few pigment granules may be scattered through the medulla of the

FIG. 10.

Section of liver $\times 800$ and reduced.

A Endothelial cells filling spaces of connective tissue B. Pigment in capillaries. C. Normal liver cells.

follicle, either in the changed or normal areas. The smaller arteries or capillaries occasionally appear in the sections, when it can be seen that they are lined by a swollen endothelium which, in parts at least, shows

a fine granular pigmentation. The capsule of the node is thickened and filled with small bloodvessels, many of which are lined by unusually large and prominent cells. The connective tissue surrounding the follicles is similarly changed.

The cortical portion of the mesenteric nodes is practically normal. The capsule is not thickened and there is no thickening of the trabecula. The medullary part of the node, on the other hand, presents changes exactly similar to those described in the medulla of the follicles of the nodes found near the spleen—that is, the lymphoid cells have almost disappeared, the normal reticulum stands out prominently, its spaces being filled with the large, irregular, almost colorless cells above described. These cells in the mesenteric nodes stain even more faintly than those in the nodes at the hilus of the spleen. The affected area is so pale that even to the naked eye the demarcation between the cortex and medulla of the node can be plainly seen. Pigment is present, but it occurs only in scattered granules. There is none of the massing of pigment in the lymph sinuses which marked the other nodes.

The liver also presents changes of interest. The capsule is thickened and the connective tissue throughout the organ is increased. The capillaries everywhere contain considerable pigment like that seen in the lymph nodes. The liver cells are normal. The bile ducts are normal. In the blood that fills the branches of the portal vein there are large cells of the type seen in the pulp spaces of the spleen. Considering the number of these cells free in the pulp spaces of the spleen and the fact that these spaces are the radicles of the splenic veins, this is not surprising. The walls of the veins containing these cells are normal.

In none of the many sections examined was there found any evidence that these cells had effected a permanent lodgement within or grown from the branches of the vein in which they were present. However, in many of the areas of perilobular connective tissue an arrangement or development extremely like that described above as seen in the lymph nodes can be seen. (See Fig. 10.) This consists of irregularly round or oval spaces bounded by delicate connective tissue walls, and filled with large, pale cells of irregular shape, and containing large nuclei. The cells are remarkable for their large size, both of body and nucleus. In many of the spaces the cells fuse together so completely as to make it very difficult to distinguish the outlines of the individual cells.

When first seen these areas were looked upon as almost certainly metastases. Further consideration has led the writer to the opinion that these cells have been developed from the tissue in which they lie. The areas in which these cells occur are in all cases small, although from the clinical history the process in the spleen must have been going on for thirteen years. The growth of cells, while it distends or enlarges the size of the connective tissue areas in which it occurs, never oversteps the limits of the connective tissue or advances into the surrounding tissue. The integrity of the branches of the portal vein has already been mentioned.

With these facts in mind, it seems fair to conclude that these cells in the liver are not metastases, but have been developed in the situations in which we find them from the endothelium lining the lymph spaces of the connective tissue.

The lungs show a slight thickening of the walls of some and a dilatation of others of the air spaces. There is congestion of all the vessels, and in the perivascular lymph spaces surrounding the larger vessels there is a moderate amount of dark, almost black pigment.

The heart is normal.

The kidney: The left shows a remarkable dilatation of several of the straight tubules by which the surrounding tubules are much compressed. In some of the sections there are small areas of lymphoid infiltration. Otherwise the organ is normal. There is no pigment present. The suprarenal shows some degeneration of the cells of the medullary portion, but in the main is normal.

The intestine in some parts shows a moderate degree of simple hypertrophy of the lymph nodules, otherwise is normal.

The pigment observed in the lymph nodes and liver deserves some further description. In fine granules it has a light yellow hue, in masses it is dark brown. In the lymph nodes some of the granules are evidently intracellular, some of them, especially in the lymph sinus, are free. The relation of the larger masses to the cells cannot be made out. In the liver the pigment is found free in the capillaries, not at all in the cells. Both in the nodes and in the liver the pigment in sections treated with solutions of ferrocyanide of potassium and hydrochloric acid gives the iron reaction. Its distribution, the lymph sinuses of the lymph nodes and the capillaries of the liver show that it must have come from the spleen. Such pigment formation in enlargement of the spleen is not unusual. In this case the amount of pigment is remarkable. The pigment above described corresponds to the hæmosiderin of Neumann.

The pigment observed in the lymph spaces surrounding the vessels of the lung is black in color and does not give the iron reaction. It is, therefore, not of the same origin as that in the lymph nodes or liver.

When, with these descriptions of these cases and the results of the morphological examination before us, we endeavor to name the lesion we find ourselves facing a difficult problem. At first sight it seems that we have to do with an endothelioma of the spleen, with metastases in the lymph nodes and liver. The huge spleen is made up in part of areas of connective tissue, in part of areas in which the pulp spaces of the spleen are filled with endothelial cells. The normal cells of the splenic pulp have disappeared. Under the microscope there is nothing but the shape and arrangement of the spaces in which these endothelial cells lie and the presence of the Malpighian bodies to show that it is the spleen we are dealing with. In the lymph nodes we find a similar process, the disappearance of the normal cells of the organ and the development of an unusual number of endothelial cells. In the liver, also, we find areas in the perilobular connective tissue in which there has been an unusual development of endothelial cells in the lymph spaces. It must also be noted that the arrangement of these cells in the connective tissue of the liver corresponds to some extent to that found in the endotheliomas of the pleura described by many observers. Against the acceptance of this hypothesis we have the following considerations: First of all it is to

he remembered that the process, whatever its nature, had existed for thirteen years in the case that came to autopsy, and that even then the condition of the patient was not incompatible with the prolongation of life for some years further. Moreover, the same process, in all probability, is developing in a younger sister at exactly the time of life the disease appeared in the elder. These facts unquestionably point to the action of some systemic poison rather than to a tumor.

With regard to the spleen itself, we note a number of facts not consistent with the hypothesis of endothelioma. After all the years the process has been going on the organ is still a spleen—the shape (the surfaces are those of a spleen) and even the notch in the anterior border are preserved. Moreover, while the spleen was adherent there was no direct extension of the process beyond the bounds set by the capsule of the organ. Within the spleen itself we find also that the spaces in which the endothelial cells lie are those which normally belong to the spleen, the walls of the spaces being the connective tissue framework of the spleen itself. This point can be well brought out by contrasting with a section of the spleen in question another taken from a case of empyema, which is characterized by simple dilatation of the pulp spaces of the spleen without the endothelial multiplication. (See Figs. 5 and 6.) In this case we find the round or oval spaces separated by walls of delicate connective tissue lined with small endothelial cells. In the spleen we are studying we find like spaces filled with cells, which we have shown have sprung from the endothelium lining their walls. The essential difference between the two is the size and number of the endothelial cells in the latter case. If increase in size and number of endothelial cells constitutes an endothelioma, then this process must be so classified; but by a similar line of argument any simple hyperplasia of the spleen marked by multiplication of the proper cells of the splenic pulp would become a tumor of the spleen. Finally, the decisive objection to the endothelioma hypothesis rests in the fact that there is nothing that can be regarded as an autonomous growth within this spleen. Neither on gross nor microscopic examination can we define a growth independent of the structure of the spleen itself; in fact, as has been pointed out, the very opposite is true.

The requirement that a tumor must be an autonomous growth, enunciated as a doctrine by Thoma,¹⁴ is indorsed by Ziegler,¹⁵ Lubarsch,¹⁶ Prudden¹⁷ and others. If we accept that doctrine we cannot regard the change in this spleen as a tumor, and it cannot, therefore, be called an endothelioma. We are driven to regard the process as a hyperplasia of the spleen characterized by an unusual development of endothelial cells and the transformation of a considerable part of the organ into dense connective tissue. It is possible in some of the sections to demonstrate, so far as such a process is demonstrable, that some of the endothelial cells go to form part of the connective tissue increase.

The question next arises what relation, if any, the changes in the lymph nodes and liver bear to the process in the spleen. Are they metastases or not? There are good reasons for a negative reply.

With respect to the lymph nodes, the proliferation of endothelial cells both in the lymph sinus and in the medulla of the node is exactly similar to that frequently seen in other diseases. It is to be noted that practically every follicle of a node is similarly affected, and yet in almost every one of them some part of the follicle remains normal. The delicate reticulum of the node is everywhere preserved. There is not the unruly growth characteristic of malignant metastases.

The condition found in the liver, while, as already admitted, similar to that described as endothelioma of the pleura, etc., is a diffuse, not a localized process. It occurs in all parts of the organ. The individual areas are very small. The walls of the hepatic artery and portal vein are not affected. The cells brought from the spleen, many of which can be seen lying within the branches of the portal vein, have not been able to effect a permanent lodgement within them, and as there is no direct connection of the lymph spaces of the liver with those of the spleen, the cells cannot have been lodged in the liver by that channel. Finally, the increase in the endothelial cells is limited wholly to the connective tissue areas, and in no part have the cells spread beyond the limits of these areas. The liver cells proper are unaffected by the process. The writer, therefore, regards it as reasonable to look upon this multiplication of endothelial cells in the lymph spaces of the connective tissue of the liver as not the result of metastases.

Viewed as a whole the characteristic feature of the process in spleen, lymph node, and liver is the multiplication of endothelial cells, associated in the case of both spleen and liver with a great increase in the connective tissue of the organ.

If, as the writer believes, the processes in the lymph nodes and liver are not metastases, we must suppose that some influence has affected these several organs in the same way. The process in the spleen and lymph nodes is exactly similar, though much greater in degree, to the changes that are sometimes observed in typhoid fever, tuberculosis, and other infectious diseases.

Literature dealing with similar cases is extremely scanty. In a *Thèse de Doctorat*, by E. Gaucher, Paris, 1882, the writer is persuaded that the same affection is described under the title of "Splénomégalie Primitive—Epithélioma primitif de la rate." An epitome of the thesis runs as follows:

The patient was a woman who died at the age of thirty-two years from an intercurrent pulmonary tuberculosis. The splenic enlargement dated from the age of seven years; had therefore existed for a period of twenty-five years. It had been accompanied by repeated epistaxis, ulceration

of the gums and oozing of blood therefrom, occasional attacks of abdominal pain, disturbance of the functions of the stomach and intestines, and occasional jaundice. None of these attendant symptoms were constant. The blood showed the changes of simple anæmia. The patient finally died of exhaustion due to tuberculosis. The autopsy showed tubercular lesions of the lungs and peritoneum, moderate enlargement of liver, a huge spleen weighing 4 kilogrammes 770 grammes, normal lymph nodes. The enlargement of the liver was found to be due to a diffuse cirrhosis which the author considered secondary to the splenic enlargement. The spleen, both macroscopically and microscopically, presented lesions in all essential respects the same as those in the writer's case. The drawings which accompany the thesis leave no doubt of this. The nature of the error by which the designation of primary epithelioma of the spleen is given is made clear by the author's remarks. He calls the large cells found in the spleen epithelial or epithelioid by reason of their morphological appearances and their staining relations, and does not classify them according to their origin.

In Bouchard's *Pathological Anatomy*, 1899, vol. iii., part ii., p. 894, a cut of Gaucher's is reproduced under the designation of endothelioma of the spleen.

Following Gaucher, Picou and Raymond¹ present a report of a spleen removed by operation from a woman of thirty-two years. The enlarged spleen was mistaken for a uterine fibroid, because of a history of menorrhagia for a year before the operation. The only other symptoms were vague abdominal pains, extending into the lower extremities, swollen and bleeding gums, some disturbance of digestion, and œdema of the ankles. The patient recovered from the operation. The spleen presented the lesions described by Gaucher, and the reporters accepted his title of primary epithelioma. The blood showed the changes of simple anæmia. In the report of Picou and Raymond occurs this significant paragraph: "In the opinion of Cornil²⁶ the lesions described by Gaucher cannot be primary epithelioma. This author does not admit the existence of primary epithelioma of the spleen. Despite the appearance, he believes this case to be a primary hypertrophy of the spleen, with proliferation of the reticular tissue. As for the cells, they recall the appearances he has often observed in glandular hypertrophies."

In English literature William Collier² presents a detailed account of the lesions found in a girl, aged six years, whose death is said to have been accelerated by an attack of "epistaxis and sickness." An elder sister of the case reported had also died with a greatly enlarged spleen. The lesions of the spleen found by Collier correspond to those in the writer's case. The lymph nodes were also enlarged, and presented lesions similar to those described by the writer. Collier is evidently

inclined to call the process endothelioma. The specimens were submitted to the Morbid Growths Committee of the London Pathological Society, who call attention to the similar affection in the sister, note that the most striking feature in the microscopical examination of sections from the central part of the spleen is the presence of an enormous number of endothelial-like cells, but add that "this appearance is similar to that which is not uncommon in the lymphatic glands, and was present in the lymphatic glands in this case." The committee's position is evidently that of mild dissent from the author's view. The blood examinations made by Collier showed that the case was not one of leukaemia.

Weichselbaum,³ in Germany, reports the examination of a spleen removed from a soldier, twenty-one years of age, under the title "Primary Multiple Endothelial Sarcoma of the Spleen." No history is given. The microscopical lesions described are strikingly like those described by the writer in the parts of the spleen shown in Figs. 5 and 6. Weichselbaum calls attention to the apparent fusion of the endothelial cells with the reticulum of fibrous tissue in which they lie. So high an authority as Birch-Hirschfeld⁴ has reviewed Weichselbaum's case, and declares that the new formations were "not tumors, but a large-celled focal hyperplasia."

The writer may therefore claim the authority of Cornil, the Morbid Growths Committee of the London Pathological Society, and Birch-Hirschfeld for the view that he has taken of the lesions found in these cases.

The writer's cases are of almost as much interest clinically as pathologically. Their clinical relations may be briefly summarized thus:

Case I. Great enlargement of both liver and spleen, simple anæmia, slight enlargement of superficial lymph nodes.

Case II. Enormous splenic enlargement and moderate enlargement of the liver, simple anæmia, slight enlargement of superficial lymph nodes; affection of thirteen years' duration. Patient's sister had enlargement of spleen beginning at practically the same age. It may therefore be safely assumed that whatever the disease it is the same in the two cases.

From both the history of the patients and the clinical observations it is apparent that the enlargement of the liver is secondary to that of the spleen.

So far as the enlargement of the superficial lymph nodes is concerned, it being so insignificant in comparison with the enlargement of the spleen, and, furthermore, an equal enlargement of the superficial nodes is so commonly met with in children whose nutrition is under par from any cause, that it seems that this feature of the cases may be safely dropped from consideration. We have, therefore, left for study only the splenic and hepatic enlargements with the blood changes of simple anæmia.

While simple anæmia may be accompanied by moderate splenic enlargement, no one would suggest that the anæmia in these cases could account for the splenic enlargements. Either the enlargement of the spleen is the cause of the anæmia, or they are dependent upon a common cause, or have no relation to one another. At all events, the explanation of the progressive enlargement of the spleen becomes the important point in these cases.

Chronic enlargement of the spleen may be due to various influences, such as cardiac disease, or any cause of continued enlargement in the portal system, amyloid degeneration of the viscera, the blood diseases, leukæmia, etc., tuberculosis, rhachitis, malaria and syphilis. (The rarity of primary new growth of the spleen, the length of time the disease had existed in the first case, the occurrence of the affection in a sister at the same period of life, were, in the early study of the cases, held sufficient grounds for the exclusion of the hypothesis of a new growth.) The clinical history, the absence of temperature, the absence of any evidence of tuberculosis elsewhere excluded tuberculosis. No cause for venous enlargement or amyloid degeneration could be found. The blood examinations excluded leukæmia. As for rhachitis, the splenic enlargement only began at the age of three years, while that of rhachitis occurs during the first or second year; moreover, there is no history of rhachitis, and the children showed no evidence of any previous rhachitic affection.

The absence of malarial history, the negative results of examinations of the blood for malarial organisms, the moderate degree of anæmia in comparison with the size of the splenic tumor, and finally the impotence of arsenic, seem to fairly exclude the possibility of progressive malarial poisoning.

Hereditary syphilis presents the final and most difficult alternative. The history of the death of four children during infancy, together with one still-birth, certainly suggests the possibility of specific disease in the family, although the early deaths were attributed to "summer complaint" and were not consecutive. The weight of evidence is, however, altogether against the acceptance of syphilis as the explanation of our problem. So far as could be learned the children that died gave no evidence of syphilis. The mother herself bears no traces of such disease. Three other living children, intervening in age between the two sisters, are perfectly healthy; and, finally, apart from the splenic enlargement, neither of our patients presents any of the characters of hereditary syphilis. In the face of such facts it would not appear reasonable to maintain that we are here dealing with hereditary syphilis, finding its only expression in the enlargement of the spleen and liver. It being therefore impossible to account for the splenic enlargement upon the basis of any of the affections enumerated, we are led to conclude that we have to do with a primary or idiopathic enlargement of the spleen.

The changes in the spleen (and liver) are accompanied by simple anæmia.

The ages of the patients, as well as the absence of leucocytes or any morphological changes in the red cells, show at once that we are not dealing with the affection peculiar to infancy, described by von Jaksch,⁵ Loos,⁶ and Luzet⁷ as anæmia infantum pseudoleukæmica.

The cases do present a close relationship in their clinical features to the affection variously described as splenic anæmia or splenic pseudo-leukæmia. The use of the latter term seems only to increase the confusion of a sufficiently difficult subject, and is avoided. The subject of splenic anæmia has been thoroughly discussed lately by Sippy¹⁷ and Osler.²⁸ It is sufficient for our purposes to note that its characteristic features are considerable enlargement of the spleen, associated with more or less marked anæmia. The pathology, so far as known, is that of chronic interstitial splenitis.

From the type of splenic anæmia the cases herein reported present some points of difference.

1. The age of the patients, or, better, the age of the patients at the beginning of the splenic enlargement. Splenic anæmia is essentially a disease of adult life. Of late, Carr,¹⁸ Fox and Ball¹⁹ in England and Glockner²⁰ and others in Germany have reported a number of cases of splenic anæmia in children, most of them under two years of age, and only one traced to the age of three and a half years. The condition is evidently the simple anæmia associated with enlargement of spleen and possibly liver, due, as a rule, to rickets or syphilis. During this early period enlargement of the liver is so common from a fatty infiltration that that symptom should be given much less weight than belongs to it at a later age. From the reports cited we learn that splenic anæmia regularly yields to dietetic treatment with cod-liver oil and iron, yet, from time to time, cases are seen in which the tendency of the spleen to hypertrophy cannot be controlled by any form of treatment. None of the latter cases have been followed to the end. In all the autopsies recorded the lesion of the spleen was a chronic interstitial inflammation with hypertrophy. The writer's cases belong neither to the adult nor to the infantile type of splenic anæmia, but stand between them.

2. The progressive character of the malady. The enlargement of the spleen and the anæmia advance despite all forms of treatment. Splenic anæmia is regularly amenable to treatment.

3. Despite its progressive character, the affection seems not to be fatal *per se*. Gaucher's case lived to her thirty-second year and finally succumbed to tuberculosis. The first of the writer's patients reached the age of sixteen, and would probably have lived some years longer without operation. Although the second case is developing some cachectic symptoms there is no prospect of early fatal conclusion to the process.

4. The chronicity of the affection. The enlargement of the spleen in Gaucher's case dated back twenty-five years, in the elder of the writer's cases thirteen years.

5. The enlargement of the liver. This does not belong to the adult type of splenic anæmia, and its occurrence in the infantile type, as above suggested, is probably due to the fatty infiltration common at that age.

6. The huge size attained by the spleen, transcending all other features of the affection, and rarely seen in any other affections except chronic malaria or leukæmia.

7. The occurrence of two cases in sisters in the report of Collier and the same phenomenon in the writer's cases is worthy of note. This feature of the cases certainly suggests the action of some systemic poison affecting several members of a family.

8. The cases of Gaucher, Picou and Raymond, Collier and the writer are all females.

The only affection that one can suggest which meets the requirements of these cases is hereditary syphilis, yet, as already seen, there is no other evidence of the presence of this disease in the family.

It cannot be assumed that the points enumerated will suffice for a complete differentiation of our cases from splenic anæmia. In France, the terms splenomegaly and splenic anæmia have evidently been used as synonymous. Debove,²¹ Bruhl,²² Peter,²³ Rendu²⁴ and others have reported cases of adult splenic anæmia as splenomegaly, and Gaucher²⁵ has maintained that the cases in question belonged to the type he had described in his thesis.

In Italian literature we find still another designation for these cases. The first reports came from Banti,⁹ under the title "*Splenomegalia primitiva con cirrosi epatica*," which has been followed by Rinaldi,¹⁰ Bonardi,¹¹ Maragliano,¹² Casarini¹³ and others. Sometimes it is called *malattia del Banti*. Banti himself admits the close relationship of the affection he has described with splenic anæmia and the possibility that it is identical. Among the cases in Italian literature are some, notably one of Rinaldi's, presenting very close resemblance to the writer's cases. At present the only sufficient distinction of the type of disease herein reported is the pathology. That is altogether different from anything else to be found in medical literature.

Upon the basis of the observations recorded above the writer believes that it can be maintained:

1. That the affection first described by Gaucher as primary splenomegaly, or primary epithelioma of the spleen, is a definite and distinct disease.

2. That the process is not a new growth, but an endothelial hyperplasia of the spleen, and that it may be associated with like changes in the retroperitoneal and mesenteric lymph nodes and the connective tissue of the liver.

The symptomatology of the affection as derived from Gaucher's thesis and the writer's cases may be briefly summarized thus :

1. Enlargement of the spleen, beginning in childhood (second to seventh year), slow, progressive.

2. Enlargement of the liver, secondary to that of the spleen, may be considerable, but never reaches the extent of the splenic affection.

3. Simple anæmia. The only changes observed in the blood are those associated with any chronic enlargement of the spleen.

4. Softening of the gums with oozing of blood.

5. Epistaxis repeated. Osler has noted the association of this symptom with chronic splenic enlargements.

6. Cutaneous hemorrhages and icterus, present in Gaucher's case, not in the writer's.

7. Symptoms referable to the mechanical effect of the splenic enlargement : Pain in the abdomen ; disturbance of functions of stomach and bowels ; dyspnœa ; dysuria ; cramps in the legs.

8. The case recorded by Picou and Raymond shows that the earlier stages of the disease may be overlooked and the first evidence of the enlargement of the spleen be the effect of its weight.

9. The problem of the clinical differentiation of cases of the type herein reported from splenic anæmia must be left to the experience of the future.

In conclusion, the writer must acknowledge his indebtedness to the attending staff of the Presbyterian Hospital for the many courtesies extended in allowing him to follow the cases while in that institution and to make use of their records. He is especially indebted to Dr. G. A. Tuttle for the record of the autopsy and the material from which his studies were made. To Dr. Prudden, the Director of the Pathological Laboratory of the College of Physicians and Surgeons, the writer would express his most sincere thanks for the criticism and counsel which guided him all through his work.

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PRIMARY ECHINOCOCCUS CYSTS OF THE PLEURA.

REPORT OF A CASE OF PRIMARY EXOGENOUS ECHINOCOCCUS CYSTS OF THE PLEURA, SHOWING HYALINE DEGENERATION OF THE CUTICLE WITHOUT LAMELLATION, WITH NOTES FROM THE LITERATURE.¹

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It has seemed advisable to report in detail the following case of echinococcus cysts of the pleura, both because of the rarity of hydatid disease in America, and especially because of the atypical degeneration of the cyst-walls found in the case, obscuring their true nature and causing difficulty in the diagnosis.

Summary. Physical signs of chronic pleurisy, with adhesions and effusion at right base; aspiration of albuminous fluid loaded with cholesterin crystals; clinical diagnosis of chronic encysted pleural effusion. Operation. Lung free, no adhesions, no effusion; removal from pleural cavity of a small mass of collapsed cysts resembling grossly echinococcus cysts. Microscopical

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examination. Outer cyst-wall thin, hyaline, without lamellation, and infiltrated with cholesterin crystals; lining membrane degenerated and fatty, and containing much cholesterin, but no scolices or calcareous corpuscles; final discovery, after continued search, of two echinococcus hooklets. *Anatomical diagnosis:* Degenerated, exogenous, primary echinococcus cysts of pleura.—J. O., aged thirty-one years, a mulatto (mother black, father white), single, a kitchen servant in restaurants, applied for treatment at the dispensary of the University of Buffalo, January 26, 1900, complaining of shortness of breath on exertion, dull pain in the lower right chest, and inflammation of the bladder. The diagnosis of chronic pleurisy, with adhesions and effusion, was made, and the patient was admitted to the Buffalo General Hospital, February 2, 1900.

Personal History. The patient was born in Virginia and lived in that State until the age of twenty-one, and *had never been outside the United States.* He had malaria, at Newport News, at the age of twenty-one, and typhoid fever, at Charlottesville, at twenty-three. About two years ago he had pneumonia, and was in the hospital at Charlottesville from January to April, 1898. In convalescence he developed pleurisy on the right side and was tapped of "about three quarts" of a clear yellow fluid; recovery, except for a "tender feeling" in the lower right chest occasionally on catching cold. In the autumn of 1898, at Washington, D. C., he developed pleurisy on the right side, and "about three quarts of a yellowish fluid containing some white matter" was aspirated from the chest. After this he remained well until the autumn of 1899, when a dull aching pain developed in the lower right chest, with dyspnoea on exertion, requiring him to stop work at about Christmas. About this time, also, he first noticed that his urine contained considerable white sediment and that his micturition was frequent and was accompanied with pain at the end of the act, which was referred to the glans penis. He denied any history of gonorrhoea, but admitted having had a sore, at the age of twenty-five years, on the penis, which was followed by a blotchy eruption over the body and general bone-aching. He took treatment, and recovered. Since his present illness began, about last Christmas, he has lost considerable weight and strength, and has been unable to work. He has never had jaundice to his knowledge. In regard to his association with dogs, he said that he always lived with them until he left home at the age of twenty-one, since which he has not had much to do with them.

Condition on Admission. The patient was a small, thin, anæmic, sickly-looking mulatto, weighing 115 pounds. A blotchy pigmentation was observed over both cheeks. Lips and mucous membranes were pale, conjunctivæ clear; finger tips and nails showed no clubbing or incurvation. Temperature, 98.5° F.; pulse, 78; respiration, 24.

Thorax. On *inspection*, nothing distinctive noted; no bulging; respirations shallow and increased in frequency. On *palpation*, over the lower right chest in the axillary line at the end of deep inspiration was felt a very rough, prolonged, vibrating friction of maximum intensity. Vocal fremitus was diminished over the right base up to the level of the fifth space; above this normal. On *percussion* there was marked dullness over the right base, rising to the level of the fifth space in the axillary line and sagging somewhat below this level in front and dropping abruptly behind close to the spinal column. The percussion note was not quite flat over the base, though nearly so in the midaxillary line.

The upper limit of dulness moved very slightly on change of position. On *auscultation*, over the area of dulness the breath sounds were not audible, but the spoken voice could be heard faintly. At the end of inspiration a rough, harsh, loud friction sound was heard in the axillary line as high as the fifth space. No râles were heard. The thorax otherwise showed nothing abnormal.

Heart. Point of maximum impulse in the mammillary line in the fifth space ; sounds clear.

Liver. Edge could be felt just at the costal margin.

Spleen. Not palpable.

Abdomen. Negative ; no tenderness on pressure over flanks or hypogastrium.

Genitalia. Endoscopic examination (kindly made by Dr. E. J. Meyer) showed a stricture of the membranous urethra, and superficial ulceration of the prostatic urethra ; no growths or cysts in the bladder.

Urine. Sp. gr., 1017, slightly alkaline, considerable albumin, no sugar, considerable pus, and an occasional hyaline cast.

Sputum. [No material from the deeper air passages could at any time be obtained.]

The *diagnosis* of chronic pleurisy with adhesions and effusion was made, and on February 10th exploratory puncture with a hypodermatic needle was made. *The needle was inserted four times without result in different places over the area of dulness, but on the fifth puncture, in the sixth space in the anterior axillary line, the syringe filled with fluid, which was of a straw-yellow color, and opalescent on agitation. It was found to contain a large number of cholesterin crystals, a considerable amount of albumin, and a trace of sugar. Tubercle bacilli were not found.*

The large amount of cholesterin crystals in the fluid excited suspicion of old cystic formation, but as no evidence of echinococcus was found the case was assumed to be one of simple, chronic, *encysted*, pleural effusion. After a few days, as no improvement had taken place, it was decided to withdraw the fluid by aspiration. On this occasion *the needle was inserted also five times before fluid was obtained, when about one-half litre of fluid of the same character as above described was withdrawn.*

A week later dulness was still found over the right base, though less marked than before. Dr. Roswell Park saw the case at this time and suggested the possibility of hydatid cyst. The patient remained unimproved, and it was decided to open the supposed encysted cavity and produce its obliteration.

Operation. Operation was performed by Dr. Roswell Park, on February 24th. Before incising the chest-wall a small syringe of fluid was aspirated from the right base on the first puncture. This fluid was in every way similar to the fluid previously aspirated. The chest-wall was then opened and several ribs were resected. The costal pleura was found considerably thickened. After entering the pleural cavity, to our surprise, the lung was seen to be free from adhesions, and no encysted cavity or fluid was found. The lung showed on its surface several small, round, opaque, nodular spots that suggested calcified tubercles. No fluid could be found, and only about two ounces of bloody fluid could be drained from the chest by turning the patient on the right side. In exploring the pleural cavity with the hand *a soft mass was withdrawn without appreciable resistance, which was about the*

size of a lemon and consisted of a mass of collapsed cysts closely united together. No fistula through the diaphragm could be felt. The operation was terminated by placing drainage in the chest cavity.

Subsequent History. The patient rallied well from the primary operation, but his pulse, temperature and respirations tended to increase with considerable irregularity. About one week later his condition grew worse and a secondary operation was done, enlarging the opening in the chest and cleansing the cavity, which had contracted down to rather small size. Free drainage and irrigation of the cavity were maintained throughout the course of the case. The general condition of the patient tended gradually downward with high and irregular rate of pulse, temperature, and respiration. During the last week of illness the temperature ranged irregularly between 99° and 104° F., the pulse ran from 120 to 140, and the respirations were from 40 to 52 per minute. The physical signs of pneumonia were not found. The patient died on May 4, 1900, without the development of special symptoms. Autopsy could not be obtained.

Pathological Notes on the Fluid and Cysts. 1. *Fluid.* This was faintly alkaline in reaction, of a straw-yellow color, and was clear except for a distinct opalescence when it was agitated, giving the impression that it contained a suspension of gold-dust. Chemically it contained a fair amount of albumin (coagulation by heat, potassium ferrocyanide, biuret tests, etc.), and a faint trace of grape sugar (Fehling's test). Sodium chloride was not present in excess. Tests for succinic acid and bile pigments were negative. Microscopically the fluid showed (a) *cholesterin* crystals in very large number, (b) occasional red blood-corpuscles (from the puncture, undoubtedly), (c) a few degenerated fatty cells, without nuclei, and (d) a few round, colorless bodies (4–18 μ), resembling crystals, that did not dissolve or effervesce on the addition of HCl. No *echinococcus scolices*, hooklets, calcareous corpuscles, or laminated cyst-membrane could be found in a search continued many days. The three specimens of fluid aspirated at different times were all similar in every respect. The specific gravity of the second specimen was 1026.

2. *Cysts.* The mass removed from the pleural cavity at operation consisted of a small mass of collapsed cysts closely adherent to one another, and varying in size from that of a millet-seed to that of a small lemon. The different cysts were, in general, easily separated by gentle traction, though some of them were so closely united that they could not be separated without rupturing their walls. Many of the cysts were found to spring from the walls of adjoining cysts, having a wall in common at their line of union. In the largest cyst, extending inward from its outer wall, were seen two or three small cysts, giving the appearance of daughter-cysts, but no free daughter-cysts were found. The number of individual cysts was not counted, but appeared to be approximately forty. Externally the cyst-walls looked very thin and delicate, white, translucent, and glistened with the impregnation of crystals. When cut the cyst-wall showed no tendency to curl. The interior of the cysts showed a relatively thick, soft, white, granular layer, which could be removed by the slightest touch. The cysts were all collapsed and without fluid content. When placed in water the cysts absorbed it and swelled to a globular form.

The *microscopical examination* of the fresh cysts showed as follows: (a) The *external wall*, when teased, showed no true lamination, though

slight suggestions of it were seen in occasional bands of fibrils. No cell structure could be made out. The tissue looked hyaline and structureless. Abundant cholesterin crystals were seen throughout. Treatment with dilute acetic acid and potassium hydrate solution did not modify essentially the appearance. Frozen sections stained with hæmatoxylin and eosin showed the same hyaline appearance, with many bands or striations branching off toward the interior of the cyst. On the surface an occasional degenerated cell nucleus was seen, but no true organized cellular membrane. (b) The *soft material lining the cysts* was found to consist chiefly of fatty detritus and cholesterin crystals. There were many degenerated fatty cells, without nuclei, which stained well with Sudan III. An occasional, small, round, colorless, crystalline body was also seen, which did not dissolve or effervesce in dilute HCl. An exhaustive search, lasting for many days, for echinococcus scolices, hooklets, or calcareous corpuscles, was without reward for our labor, but Dr. Stiles, to whom specimens were submitted (see below), was more fortunate in his examination, and succeeded in finding in the cyst content two *echinococcus hooklets*.

Sections of the cysts hardened in alcohol and formalin offered no evidence not obtained from the frozen sections. The histological examination of the walls of the small daughter-cysts protruding toward the interior of the largest cyst showed exactly the same structure as found in the larger external cysts, except that the few cells and nuclear fragments found at the periphery of the outer walls of the external cysts were not found over the walls of the daughter-cysts.

Believing, as we did, after a careful study of the case, that we were dealing with an atypical and rare form of degenerated echinococcus cysts, and before we had obtained conclusive support of our diagnosis, we submitted specimens of the fresh cysts and also stained sections of them to Professor William H. Welch, of Baltimore, and to Dr. Charles Wardell Stiles, Zoölogist of the Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C., for their expert opinion. Extracts from their reports are here given, with their kind permission, as follows :

REPORTS OF PROF. WILLIAM H. WELCH.

"I have examined the sections of the cysts. I am of the opinion that the cysts are degenerated echinococcus cysts. The gross appearances of the specimens which you showed me were like those of echinococcus cysts. The microscopical characters of the fresh teased material and of sections of the hardened specimens seem to be best explained upon the assumption that the cysts are much degenerated hydatids. Cholesterin crystals and fatty detritus such as were present in these cysts are common in degenerated hydatids. No organized tissue is present in the walls of the cysts. These walls, as shown in the sections, present an outer thin hyaline membrane, with irregular inner surface continuous with fragments and shreds of a structureless material, which occupies a considerable part of the interior of the cysts on the sections. There are scarcely any intact cells in the sections; here and there a few are attached to the outer wall and a few nuclear fragments are seen in the interior, but there is nothing indicative of suppuration or of previously organized tissue, nor is there any suggestion of fibrin or inflammatory exudate in the sections.

"As no hooklets can be detected, I have looked carefully for the characteristic lamellation of the cuticular layer of echinococcus cysts. I think that there are *suggestions* of such lamellation in the parallel striæ occasionally seen in some of the more coherent and hyaline membranous fragments attached to the wall and in the interior of the cysts, but they are not so distinct as to be convincing.

"It is well known that echinococcus cysts may perish and undergo complete disintegration. Davaine, Leuckart, Neisser and others have described such degenerative changes in the dead cysts. In some of these cases nothing remains but the hooklets to establish the diagnosis. Sterile echinococcus cysts occur, and should these undergo similar degeneration it is evident that not even hooklets would be present to aid in the diagnosis.

"In your case the degeneration has not reached a stage in which the gross appearances of echinococcus cysts have been obliterated, but the characteristic physical and microscopical features do not seem to me reconcilable with any other sort of cysts than much degenerated echinococcus cysts. As already mentioned, the large amount of fatty detritus and of cholesterin crystals within the cysts is in favor of the diagnosis of degenerated hydatids.

"Echinococcus cysts, of course, receive their nourishment from the tissues in which they are embedded, and impairment of this nutrition tends to the production of sterility and degeneration of the cysts. In your case the partial and small attachment of the cysts to the pleural membrane must have favored these results of imperfect nutrition, and in this way I should explain, at least in part, the sterility of the cysts and their degenerated condition." (April 1, 1900.)

"In my previous letter I did not speak particularly of the outward curling of incised echinococcus cysts. This physical property is well known and is demonstrable readily in fresh, undegenerated cysts. As it depends upon the integrity of the parasite, it, of course, is likely to disappear after the parasite dies and undergoes degeneration, as certainly occurred in your case, assuming it to be a bladder-worm. It would not be contended, of course, that the absence of this property would exclude the diagnosis of a degenerated echinococcus cyst.

"As I wrote you, I attach more importance in explaining the sterility of the cysts and the evidence of death and degeneration of the parasite to the comparatively limited attachment of the cysts to surrounding living structures and their consequent feeble nutrition. Most of the instances of pleural echinococci have been of single or few large cysts, firmly attached in their circumference. The topographical relations of the cysts in your case were rather peculiar and unusual." (April 5, 1900.)

REPORT OF DR. CHARLES WARDELL STILES.

"Referring again to your letters of April 5th and 15th, I have this morning made a microscopical examination of the material you sent me, and all doubts have now been removed from my mind regarding the case, for in one preparation I succeeded in finding an *echinococcus* hook. In endeavoring to isolate it and mount it for you I unfortunately lost it, and could not again find it.

"As for the interpretation of the cysts which you showed me, you will recall that at the time I examined them they did not make the

impression upon me of being hydatid cysts, nor did your microscopical preparations convince me that they were such. They certainly did not look like any echinococcus cysts which I have ever seen before, nor did they behave as such. This, however, was purely a negative opinion, and the evidence both for and against the interpretation appeared to me to be so uncertain that I was inclined to take entirely a neutral position in this regard. I have examined hundreds of specimens of this parasite from various animals, and I believe this is the first time that I have ever felt in doubt regarding the cyst itself. Finding the hook, however, removes all doubt in my mind relative to the existence at one time of a hydatid cyst in the structure." (April 18, 1900.)

It is seen from the very critical and full reports of Professor Welch and Dr. Stiles, as well as from the report of our own study of the tissues, above given, that this case was one of unusual pathological interest and rarity, and for this reason we have considered it worthy of a rather full and detailed narration of its study, step by step, through all the difficulties attached to its correct interpretation to its final and definite diagnosis. That the case was one of degeneration of hydatid cysts we entertained hardly a doubt after considering all the available evidence, but the proof of this, convincing to others, was not fully in hand until Dr. Stiles' fortunate discovery of a single¹ echinococcus hooklet.

As to the interpretation of the nature and origin of the outer cyst wall, *i. e.*, whether this thin, hyaline, structureless membrane was derived by a process of degeneration from the cuticular wall of the parasite itself or from the once cellular, fibrous capsule furnished by the surrounding tissues of the host, all doubt seems to be definitely removed by the study of the walls of the small cysts (daughter-cysts) found protruding into the cavity of the largest external cyst. Sections made through that portion of the daughter-cysts which was directed toward the interior of the large cyst showed its wall to be constituted of exactly the same hyaline, structureless membrane which formed the substance of the outer wall of the larger and separate external cysts. The lining membrane, also, of the internal daughter-cysts was identical in its histological structure with that of the external cysts. The only point of difference found in the finer anatomy between the daughter-cysts and the external cysts was the fact that the former failed to show the occasional degenerated cells and nuclear fragments found at the periphery of the latter. These facts make it clear, we think, that the hyaline, structureless membrane of the outer cyst-walls was derived by a process of degeneration from the cuticle of the parasite itself and not from the tissues of the host.

As Professor Welch has clearly stated, what little is known of the general causes leading to the death and degeneration of the bladder-worm, we need not dwell upon this feature of the case further than to

¹ Dr. Stiles writes that he has since succeeded in finding a second hooklet.

state more explicitly than we have previously done, the fact that the mass of cysts removed at operation seemed to be attached to the costal pleura in the most delicate manner, by which its removal was effected without appreciable resistance and almost by chance. This loose or partial attachment of the cysts and the churning motion to which they were subjected by the respiratory movements of the lung doubtless determined largely their degeneration.

In reviewing the various cases of echinococcus of the pleura reported in the literature, we have found no mention of a type of degeneration of the cyst-walls similar to that found in our case, nor have we been able to find any reference to such a process of degeneration in the walls of echinococcus cysts from other parts of the body. It is a fact, however, that the reports of cases only occasionally describe the histological structure of the cyst-walls, so that it is possible that the loss of the characteristic lamellation of the outer wall and its degeneration into a thin, structureless, hyaline membrane, *without gross degeneration*, may not be wholly unknown. Such a process, however, must be exceedingly uncommon, else it would have been described in the standard works on helminthology. Dr. Stiles, whose reputation entitles him to recognition as the leading helminthologist in America, states that he has never before, among hundreds of cases examined, encountered a case in which he was in doubt regarding the cyst itself.

We, therefore, assume that in reporting this case, we may, perhaps, be placing on record for the first time the type of degeneration of echinococcus walls which we have above described. Various other processes of degeneration of echinococci have been described, of which may be stated the following brief summary: The earliest changes usually begin in the surrounding capsule, which softens and disintegrates, or, on the other hand, hypertrophies or undergoes calcareous degeneration. This is followed by the fatty degeneration and disintegration of the parenchyma lining the interior of the cyst. The fluid contents of the cyst are gradually absorbed and inspissated into a granular and fatty detritus, or may undergo gelatiniform, colloid, caseous, or purulent degeneration, while the cuticle softens and disintegrates into an amorphous detritus, or may become calcified. These processes may also follow the rupture of the cyst. Sometimes the process of degeneration is so complete that there is left only a small, dried-up, knotty mass as the remains of the previous cyst.

The study of the fluid aspirated from the cysts did not assist materially in reaching a diagnosis. Hooklets, scolices, calcareous corpuscles and bits of cyst-membrane were all absent, and thus spoke against echinococcus fluid. It must be remembered, however, that these structures are found only occasionally in the cyst fluid, according to Leuckart,¹

¹ Die Parasiten des Menschen., 2 Aufl., Bd. i., 1886, Leipzig and Heidelberg.

"only in a very small minority of the cases of human echinococcus." Hooklets were mentioned in only seven out of the sixty-seven cases of hydatid disease collected by Sommer¹ from the United States. The high specific gravity (1026) of the fluid and its considerable amount of albumin were opposed to the diagnosis of echinococcus. The specific gravity of hydatid fluid ranges usually from 1005 to 1013, and albumin is said by most observers to be absent. Still, instances of high specific gravity and abundant albumin in hydatid fluid are recorded, especially in cases of degenerated hydatids. Cordier,² in a case of sterile echinococcus cyst of the liver, found a "serosanguinolent" fluid containing albumin and having a specific gravity of 1032. Bruce and Sheild,³ in a case of gelatiniform degeneration of hydatid cysts of the liver, found a gelatinous fluid that was "highly albuminous." Mosler and Peiper⁴ have found albumin in such cases of hydatids only as were influenced by a surrounding inflammatory process. Neisser⁵ states that after repeated exploratory punctures the fluid may contain albumin. Knaggs⁶ found a considerable amount of albumin in the fluid withdrawn from a hydatid cyst by the first puncture. Rosenstein⁷ and Jaeger⁸ have claimed even that traces of albumin were the rule in hydatid fluid. The presence of succinic acid is regarded as pathognomonic of hydatid fluid, but its absence is of no value as evidence. This acid is said by Leuckart to be "found in hardly any other living organism." Traces of grape sugar, as in our case, are usually found. The presence of cholesterin crystals, in large amount, is certainly suggestive of degenerated hydatids. Still, caution must be enjoined in using this point for diagnosis, for a considerable number of cholesterin crystals may be encountered in fluid from various other cysts and encysted conditions in the body, as we have recently seen in a case of degenerated simple cyst of the testicle and in a case of colloid carcinoma of the peritoneum. The large amount of cholesterin crystals in the fluid did, however, and correctly, lead us to the opinion that the fluid in the chest was at least encysted, though, as we erroneously supposed, only by inflammatory adhesions and fibrous tissue. Thus, as is seen, the study of the fluid offered little evidence for the diagnosis of hydatid cyst.

We have assumed that the fluid obtained by puncture of the chest cavity came, in fact, from the cysts. This conclusion could hardly be controverted, we think, after considering the facts above set forth. In this connection it may be worth while to explain the difficulty that

¹ Echinococcus Diseases in the United States. Medical Record, New York, Nov. 23, 1895.

² Langsdale's Lancet, Kansas City, April, 1896.

³ Med.-Chir. Trans., London, 1891-1892, vol. lxxv. pp. 175-188.

⁴ Thierische Parasiten. Wien, 1894.

⁵ Die Echinococccen-Krankheit. Berlin, 1877.

⁶ Schmidt's Jahrbücher, clxiv., p. 198.

⁷ Die Pathol. und Therap. der Harnkrankheiten. Berlin, 1886.

⁸ Meckel's Archiv, Bd. vi.

was encountered in obtaining fluid by puncture over the area of dullness. On the first occasion the needle had to be inserted five times before fluid was withdrawn, and on the second occasion also five separate punctures were made before fluid was obtained. The very loose attachment of the cysts to the costal pleura and the impregnation of their hyaline walls with crystals of cholesterin, forming a shield over them, as it were, appear to us to be sufficient to explain this fact.

As the physical examination, symptoms, and history of the case offered no evidence of the past or present existence of hydatids in other organs, we have assumed the cysts of the pleura to be primary. *Primary echinococcus cysts of the pleura* are of very rare occurrence and we have succeeded in finding only thirty-nine cases in the literature.¹ These thirty-nine cases include Neisser's² seventeen cases, Madelung's³ one case, Rosenthal's⁴ review of five cases, Maydl's⁵ collection of four additional cases, Winzerling's⁶ one case and his two additional cases found in the literature, Mosler and Peiper's⁷ one case, Ascoli's⁸ four cases, Vannini's⁹ one case, Pasca's¹⁰ one case, Orlandi's¹¹ one case, and von Bókay's¹² one case. Adding our own case to this enumeration, we have, then, a total of forty recorded cases of primary echinococcus of the pleura. Of these forty cases, thirty-two were pleural and eight were peripleural; twenty-four occurred on the right side, eight on the left side, and in eight cases the side was not stated. Echinococci of the pleura secondary to the disease in neighboring organs, especially the liver, are of more frequent occurrence, though still very uncommon.

The exogenous form of echinococcus cysts (*Exogener echinococcus*, Kuhn), as seen in our case, is relatively uncommon in man, at least in its typical form of multiple, external budding. The endogenous form (*Echinococcus hydatidosus*, Leuckart) and the simple, single cysts are the forms usually seen in man. In herbivorous animals the exogenous form is said to be common (Leuckart). A very rare form of the exogenous hyatids is the *Echinococcus racemosus* (Leuckart), which differs from the commoner form of exogenous cysts only in the greater number and

¹ This collection of cases does not include the case reported by Dr. D. F. Smith, of Walkerton, Ontario, under the title "A Case of Hydatids of the Lung" (Canada Medical and Surgical Journal, November, 1882, xi. pp. 195-197). The description of this case leads us to believe that it was one probably of primary cyst of the pleura, of the peripleural variety.

² Loc. cit.

³ Beiträge Mecklenbg. Aerzte zur Lehre der Echinokokkenkrankheit. Stuttgart, 1885.

⁴ Ueber den Echinococcus der Muskeln. Diss., Berlin, 1888.

⁵ Ueber Echinokokkus der Pleura. Wien., 1891.

⁶ Ein Beitrag zur Casuistik des primären Pleuraechinococcus. Dissert., Jena, 1892.

⁷ Loc. cit.

⁸ La Riforma medica, Napoli, 1894, p. 729.

⁹ Bullettino delle Scienze Mediche, Bologna, May, 1896, p. 240.

¹⁰ Bull. del. Soc. Lancis. deg. Osped. di Roma. 1896, anno xvi., fasc. II. p. 84.

¹¹ Gazz. Med. di Torino, 1898, vol. xlix. pp. 501, 521, and 565.

¹² Jacobi's Festschrift. New York, 1900, p. 211.

smaller size of the cysts, which resemble a bunch of tiny grapes. Indeed, were the individual cysts of our case all small, we might properly describe them as racemose hydatids. No case of multiple, budding, exogenous echinococcus cysts of the pleura has been previously described, so far as we have been able to ascertain.

The physical signs found at the base of the right chest in our case were not especially suggestive of echinococcus cysts as opposed to encysted pleural effusion, though no positive, differential, physical signs are known, save the "*fremissement hydatique*" first described by Briangon¹ and Piorry², which could hardly be expected to be obtained in its typical form through the bony chest-wall. It is possible, however, that the prolonged, harsh, vibrating fremitus which we felt and heard over the area of dulness was in fact a *modified hydatid fremitus* produced by the movements imparted to the cysts by the lung in its inspiratory expansion. An irregular line of limitation of the percussion flatness has been said to be usual in hydatid cysts of the pleura, as well as an anomalous mingling of normal and abnormal physical signs on palpation and auscultation. As illustrated by our case, there seems to be little tendency for echinococci of the pleura to invade by extension neighboring organs, excepting in the case of peripleural echinococci, and curiously, also, echinococci of the pleura rarely excite pleurisy.

The prognosis in unoperated hydatid cysts of the pleura, primary and secondary, is almost hopeless, and no remedial measure short of radical extirpation should be considered. Of the thirty-one unoperated cases of primary and secondary echinococci of the pleura in Neisser's statistics, all died without exception, including even those cases in which evacuation took place by rupture into a bronchus. The fatality of unoperated hydatid disease of the pleura is accounted for in part by the tendency of the cysts to become infected and purulent, and also, in many cases, by the profound *toxæmia* resulting from the rupture of the cysts and the absorption of their fluid, which is very toxic. Brieger³ first and later, also, Boinet and Chazovlière⁴ have succeeded in separating from hydatid fluid a toxic substance that is rapidly fatal to animals after injection. For the same reason exploratory puncture of the cysts has been followed in many cases by a rapidly developing toxæmia and death, as well as by sepsis. A common sign of toxæmia following exploratory puncture is the development of a general urticarial eruption. Because of the danger of sepsis and toxæmia resulting, it would be conservative practice to undertake a radical operation, following ex-

¹ Essai sur le diagnostic et le traitement des acéphalocystes. Thesis, Paris, August 26, 1828.

² De la percussion médiate, et des signes obtenus à l'aide de ce nouveau moyen d'exploration. Paris, 1828.

³ Langenbuch's Leber-echinococcus und seine Chirurgie, p. 78.

⁴ Revue de Médecine, November, 1898, No. 11.

ploratory puncture, at the very earliest possible moment after reaching a diagnosis of echinococcus cyst.

In conclusion, we wish to express to Professor William H. Welch and Dr. Charles Wardell Stiles our great indebtedness for their interest in our case and their valuable assistance in confirming our diagnosis.

SARCOMA AND CIRRHOSIS OF THE LIVER.

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THE combination of carcinoma and cirrhosis of the liver was pointed out by Finley and Adami in the *Montreal Medical Journal*, April, 1895, when they reported a case which showed these two different pathological conditions. Their case was followed by a paper by Fussell and Kelly, of Philadelphia, read before the Association of American Physicians, in which two other cases of a similar combination were presented.

The association of cirrhosis of the liver and carcinoma of this organ is readily explained when we remember the presence in the liver of many structures epithelial in character. The association of sarcoma and cirrhosis of the liver is possibly rarer than the association of carcinoma and cirrhosis, and the presence of the former variety of tumor is more difficult to explain than the presence of the latter.

The following case, which occurred in Dr. Finley's wards in the Montreal General Hospital, and which by his kind permission is here reported, represents a combination of an extreme grade of cirrhosis of the liver, with a large tumor mass in the right lobe, made up of sarcomatous tissues, and a number of secondary nodules scattered throughout the peritoneal cavity.

History. L. P., male, aged fifty-nine years, admitted February 15, 1900. When admitted the patient was incoherent, with a thick, halting speech, and quite unable to give any clear account of his illness. The meagre facts gained on careful questioning showed that he had used alcohol, in the form of gin and whiskey, to excess for a number of years, and had suffered from comparatively no illness of any duration up to his present attack. He stated that for three or four months he had a slight cough, with a little expectoration. He left work a month ago, because, he said, of cold sensations.

Three or four days before admission the patient's sister died, and he went on a long spree, lasting for forty-eight hours. The day before entrance into the hospital, while the patient was being shaved, he had an attack of cerebral paralysis, after which he was unable to raise his left arm or to move his left leg. He suffered from left-sided headache at the

same time. A swelling of the abdomen, which the patient said began several days before the paralysis, increased with great rapidity subsequent to this seizure.

Condition on Admission. Patient is a man, aged about sixty-five years, whose speech is so thick and indistinct as to render answers to questions almost unintelligible. He is extremely drowsy, the skin is muddy, and there are a few stellate veins about the nose, cheeks and forehead; subcutaneous fat moderate in extent, and muscles of fair size and firmness. The abdomen is greatly distended; the surface is covered with scratch marks, showing a slight dilatation of the superficial veins. There is dulness in both flanks, which changes to resonance with the shifting of the patient's body. The liver dulness extends from the fifth rib to the costal border, measuring three inches in nipple line; neither liver nor spleen is palpable.

The heart sounds are distant and feeble, apex impulse not palpable; pulse small and feeble, 120 to the minute. There is slight cyanosis of finger nails.

Complete left hemiplegia, the face being slightly drawn to the right side, the left labio-nasal fold shallower than the right. The left hand and arm and the left leg are quite powerless, the arm is held flexed across the chest; there is no rigidity of either extremity. The patellar reflexes are increased, the plantar present on the right side, absent on the left.

The day after admission the patient's condition became much worse. He developed great restlessness, and a dull, drowsy stupor; articulation was greatly impaired, and the pulse much diminished in strength and frequency; temperature between 97° and 98°. The patient died about midnight of the second day.

Diagnosis during Life. Cirrhosis of the liver and abdominal ascites, left-sided hemiplegia, and right-sided thrombosis of the cerebral vessels.

The autopsy was performed the day following the death of the patient.

Autopsy Notes. Body of a large, well-developed man of medium height; no jaundice; lips and mucous membranes pale; mouth and pharynx filled with clear watery fluid; marked lividity of dependent parts of the body, and complete rigor mortis in arms and legs; no petechia of skin; external genitalia normal.

Thorax: A few pleural adhesions at apex of right lung. Hypostatic congestion of both bases with slight acute inflammation of the walls of the larger bronchi. No areas of pneumonia or tuberculous consolidation. Pleural cavities free from fluid.

Larynx: Congested and slightly oedematous.

Thyroid: Normal.

Heart: Not enlarged; no pericardial adhesions; a thick layer of pericardial fat. Mitral valves thickened; aortic valves normal. Aorta not calcified. Heart muscle brownish.

Abdomen contains 4000 c.c., pale-yellow ascitic fluid, not blood-stained. Mesentery and omentum filled with small nodules the size of a pea, white or reddish; similar nodules scattered over peritoneal surface of abdominal muscles and of the diaphragm. The omentum was so filled with these nodules as to form a hard, stiff, ridge-like swelling, palpable just below the costal margin. Stomach and intestines normal; rectum normal.

Liver: The edge does not reach the costal margin. It is considerably shrunken in size, the surface hard, very rough, and granular. About the middle of the liver is a band of more nearly normal hepatic parenchyma which projects some distance from the otherwise hard and cirrhotic organ. On section the liver cuts with great difficulty, the fibrous tissue being greatly increased. The fibrosis is irregular in distribution, practically no normal hepatic tissue being left. The cut surface is a pale gray in color. In the right lobe of the liver is a large tumor mass about 5x8 cm. in dimensions. About a soft, white friable centre is a dense, hard peripheral zone, grayish-white in color.

Portal vein normal; no thrombosis.

Kidneys: Small, contracted, capsule strips off with great difficulty, leaving a slightly roughened, puckered surface. On section the fibrous tissue is much increased.

Pancreas: Normal; no hemorrhages.

Spleen: Not enlarged; capsule is soft, pale, and smooth. On section cortex and medulla are paler than normal.

Suprarenals: Normal.

Bladder: Contracted and muscle-wall thickened; mucous membrane normal.

Prostate: Enlarged and fibrous.

Brain: Meninges normal. The Sylvian artery on the left side just at its branching is occupied by a rather firm thrombus, whitish or grayish-white in color, slightly adherent to the walls of the vessel. On section the brain is normal. No areas of softening to be made out in any portions.

Microscopical Examination of the Liver. Microscopical examination of various portions of the liver reveals almost pure fibrous tissue infiltrated with small round cells and small spindle cells, only a few liver cells being left intact. In some areas there is a well-marked fatty degeneration of the liver cells, with considerable injection of the capillaries where the liver lobules can be made out; the cirrhosis is seen to be *interlobular* in character, while in much of the organ the lobules have been quite destroyed by the new tissue, thus representing a condition of *intralobular* cirrhosis as well.

Microscopical examination of the tumor in the right lobe of the liver shows the central part to be composed of necrosed, broken-down, sarcomatous bodies, and the periphery to consist of dense fibrous tissue infiltrated with small round and spindle cells. The central part stains badly, but shows chiefly sarcomatous cells—both spindle cells and round cells.

Nodules in the peritoneum are found to be composed of similar spindle cells, with many bloodvessels scattered through the matrix of fibrous tissue.

Anatomical Diagnosis. Hypostatic congestion of lungs; congestion of larynx and trachea; sclerosis of mitral valves; cirrhosis and sarcoma of liver, with secondary nodules in mesentery, omentum, and peritoneum; hypertrophy of prostate and of muscle-wall of the bladder; thrombosis of Sylvian artery, left side.

The presence of cirrhosis of the liver in this case is explained by the intemperate habits of the patient, who had evidently been a chronic alcoholic. The liver corresponds in type to the ordinary *atrophic cir-*

rhosis of Lænnec or the alcoholic cirrhosis, and the clinical history of the patient and the development of ascites are both explained by the condition of this organ.

The presence of the huge mass of sarcomatous tissue in the right lobe of the liver is somewhat more difficult to explain. It is a definite sarcoma of a combination of round and spindle cells. Sarcoma of the liver occurs in two varieties, primary and secondary. The primary sarcomas are exceedingly rare, and it has often been doubted by pathologists whether they ever do occur. Genuine cases are recorded, however, by Horup, Lancereaux, Arnold, Windrath, Waring, von Kahlden and others. Such tumors are said to arise from the walls of the portal vein and from the smaller bloodvessels, and von Kahlden states that frequently older cirrhotic changes in the liver exist as well. While the presence of cirrhotic changes is admitted by Quincke and Hoppe-Seyler to be a possible factor in causing the development of *carcinoma* of the liver, they do not admit that a similar cirrhotic condition is capable of producing *sarcomatous* growths. Those writers who believe that cirrhosis may cause sarcoma, do not quote any cases in which such a definite combination has been seen.

Secondary sarcomas occur in the form of metastatic tumor nodules scattered through the substance of the liver, or in the form of a diffuse sarcomatous infiltration. The primary seat of such a tumor is usually the skin or the choroid coat of the eye. The most frequent variety of secondary sarcomas is the melanotic sarcoma, the metastases of which give the liver a dark-brown or black appearance on section. The present sarcoma was not melanotic, and the pigmented coat of the eye and of the skin may be eliminated as a primary seat for this growth.

Its presence as a large tumor nodule in one lobe of the liver, unassociated with any other nodules of this organ and unassociated with any tumor nodules in other parts of the body, except the small metastases in the peritoneum and omentum, point to its being possibly primary in the liver. This cannot be stated with positiveness, however, for it is impossible to eliminate as the primary cause of any tumor masses in the liver a tumor of some one of the other organs, or some variety of cutaneous tumor which might have been removed years prior to the autopsy. It is a common occurrence in large autopsy-rooms to find secondary tumor masses in the internal organs of the body which give comparatively few symptoms during life, and which are not necessarily the cause of death, the presence of which is explained only by the discovery that the patient had, possibly some years previous to his death, some tumor removed from the skin or subcutaneous tissues.

The pea-sized bodies in the omentum and in the peritoneum were evidently derived from the tumor of the liver, or possibly from that tumor, which might have been the primary seat of both. At any rate,

the presence of the sarcomatous mass in the liver is not explained unless it be considered as a primary tumor, and its association with cirrhosis of this organ must be considered quite unique. The examination of the literature of cirrhosis of the liver, especially the standard textbooks and the various medical indices, fails to reveal any quotations of a similar combination of sarcoma and cirrhosis, although such cases have doubtless been already reported, possibly under different names, yet the combination represented by the present case is, as far as we know, the first case to be reported in this country.

REPORT OF A CASE OF MELÆNA NEONATORUM DUE
APPARENTLY TO AN INFECTION BY THE
BACILLUS PYOCYANEUS.

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THE case, the subject of this report, is that of a boy born at term in the Maternity Hospital of Philadelphia. Presentation was of the vertex, and the labor lasted but six hours. Weight of child at birth was 3350 grammes. The child seemed perfectly healthy, and the cord separated without incident, except that the period between birth and separation was decidedly shorter than usual. Nothing abnormal was noted in the condition of the child until the sixteenth day, when the resident physician called my attention to it because its mouth had become sore. On examination the condition of the mouth was seen to be due to a slight stomatitis. There was no temperature rise. The next day, while the mouth did not seem to have improved as much as I expected, and a little blood was noticeable upon the lips, the condition of the child was not apparently at all changed for the worse, except that there was a slight elevation of temperature and that its bowel movements had become green. On the following day, however, the whole appearance of the child had markedly changed. The temperature, while not excessively high, was distinctly febrile, and the slight trace of blood noticed previously had become a constant flow, apparently from the mucous membrane of the entire mouth. The bleeding was so profuse that all attempts to examine the mouth and pharynx were unavailing. The child, indeed, had to be watched carefully to prevent embarrassment of the breathing from the constantly flowing blood. Decided loss of strength was apparent. The lungs were negative. All attempts at nursing were futile. The stools at this time contained blood in considerable quantity and of a bright red color. The condition continued unchanged, except for the occurrence of a few convulsions, until the next day, the nineteenth since birth, when death took place.

The clinical diagnosis was simply melæna neonatorum, as during life there were no facts at command which would enable a more definite

diagnosis to be made. The possibility of its being a case of hæmophilia occurred to me, but the age of the child, the association of febrile temperature, and the absence of history, seemed to preclude any etiological relationship.

The post-mortem examination was made by the pathologist of the Maternity Hospital, Dr. Joseph Sailer, to whom I desire to express my most sincere thanks.

The notes were elaborate, and from them I have abstracted the most important facts.

The body was decidedly emaciated. A large, distinct, hemorrhagic effusion noticed around the umbilicus.

Abdominal cavity: No subcutaneous fat. Hemorrhage noted into the wall of the umbilical cord, and hemorrhagic effusion into the peritoneum. The cæcum was distended and somewhat adherent to the abdominal wall. In the neighborhood of the umbilical artery the peritoneum was dry and sticky. The ileum was of a slaty color, due to contained blood. The mesentery was intensely congested. The mesenteric glands not enlarged. No ecchymotic hemorrhages.

Thoracic cavity: Pleural cavities were free and contained no fluid. The pericardium was smooth, but intensely congested, particularly along the line of the anterior coronary artery.

The lungs: Pale. Numerous subpleural ecchymoses, and some areas of consolidation were found on the right side.

The heart: The right auricle was distended with blood. The foramen ovale was widely patulous. No coronary valve was present. The ductus arteriosus was not investigated. Otherwise the heart was normal.

The spleen: Normal.

The ileum: Filled with a dark-brown granular mass, which was readily removed, leaving a smooth, glistening and pale mucous membrane which showed no congestion. The folds of the ileocæcal valve contained a firm, slightly adherent clot. There was no sign of ulceration in the intestinal tract. The common bile-duct was patulous. The mucous membrane of the duodenum was clear and but slightly bile-stained.

The stomach contained a small amount of bile, but no blood. The mucous membrane was very rugous. There were no ecchymoses.

The œsophagus was filled with blood-stained mucous.

The liver was enlarged and soft, and its surface on section was distinctly cloudy. The structure was indistinct.

The pancreas was soft. There was no hemorrhage present, and its structure appeared to be normal.

The adrenals and kidneys were both apparently normal.

The brain was apparently œdematous. The membranes were very cloudy. There were no hemorrhages either into the substance or ventricles.

The histological and bacteriological examinations were made by Dr. Sailer in the Pathological Laboratory of the University of Pennsylvania.

On section through the duodenum some superficial necrosis in the mucous membrane was present, and also moderate proliferation of the epithelium cells of the villi. Very slight perivascular round-cell infiltration in the submucosa. The muscularis was normal. There was a slight exudate on serous coat. High magnification gave some cloudy swelling in the epithelial cells of the villi, and many of the cells were seen to contain swollen and pale nuclei. The walls of the bloodvessels were found to be slightly thickened.

The peritoneal exudate contained some rod-shaped micro-organisms in the superficial necrotic areas of the mucous membrane. In this area there were some cells whose nuclei were large and stained deeply, the protoplasm of the cells also taking a portion of the stain.

The pancreas showed a distinct hyperplasia of the connective tissue surrounding the bloodvessels, with some round-cell infiltration. The ducts were lined with apparently normal cylindrical epithelium, with deeply staining nuclei between the lobules. The connective tissue was generally hyperplastic, and showed here and there a few accumulations of round cells. The bloodvessels were distended with blood and their walls were distinctly thickened. In some of them the intima was detached and in others distinctly swollen. The media was slightly hypertrophied, but the thickening affected chiefly the adventitia, which was usually about twice the thickness of the media. The walls of the veins were distinctly thickened and surrounded by a mass of fibrous connective tissue. The cells of the pancreas stained very irregularly. In many of them there was distinct alteration of the protoplasm which stained deeply with eosin. In many places the granular acini were pushed apart by dense infiltration of cells having round or oval nuclei. The bodies of Langerhans were numerous, frequently slightly lobulated, and in some places there was apparently degeneration in the cells, the nuclei being enlarged, irregular, and staining very deeply, the protoplasm retaining the hæmatoxylin stain. Staining by thionin gave essentially the same changes. No micro-organisms could be detected in the tissues. Occasional eosinophile cells were observed in the midst of the cellular infiltrate. Many of the nuclei of the cells of the pancreas showed extreme vacuolation. In some cases two deeply staining nuclei were found in the same cell. Vacuoles also occurred in the cellular protoplasm.

The liver showed the same hyperplasia of the connective tissue, with moderate round-cell infiltration, particularly perivascular, as in the pancreas. The bloodvessels were distended. The bile ducts were apparently normal. Here and there the substance of the liver was infiltrated with red blood cells. The small vessels of the substance were surrounded by round cells possessing a single round vesicular nucleus. The arterial walls were greatly thickened, particularly the adventitia. The walls of the veins were also considerably dilated and surrounded by connective tissue. The nuclei of the liver cells were all about of equal size and stained distinctly with a clear chromatin. In addition, there were a number of small cells with deeply staining nuclei, and some larger round cells, the protoplasm of which retained the hæmatoxylin stain. With immersion the nuclei could be seen to have the normal structure. The small dark cells were evidently polynuclear leucocytes. There were in addition certain cells showing fragmentation of the nuclei. The protoplasm of the liver cells took eosin stain faintly. There were some clear globules in the tissue. The radicles of the hepatic vein were distinctly distended, but were apparently normal. The portal vessels were also distended, but not markedly. The protoplasm of many of the hepatic cells appeared to be slightly granular. There were no organisms found in the tissues. The intestines showed a moderate necrosis of the superficial layer of the mucosa and some thickening of the submucosa, with considerable round-cell infiltration about the glands. The serous coat appeared to be normal. The epithelial cells were in part desquamated, and appeared to have proliferated. The epithelial cells of the crypts

were normal. The bloodvessels showed a slight thickening of the walls. The mucuous membrane contained a large quantity of rod-shaped bacilli.

The spleen: Trabeculæ were prominent, and the walls of the bloodvessels were tremendously thickened, particularly the adventitia. The perivascular connective tissue was also distinctly hyperplastic. In some areas there was intense perivascular round-cell infiltration. Throughout the greater part of the tissue in this section there was hemorrhagic diffusion, but other parts were relatively free. The nuclei of the cells stained distinctly. There was no evidence of giant-cell formation or of fragmentation. The capsule was about normal in thickness, but it sent several trabeculæ into the substance which were quite thick, and which branched more or less extensively. The presence of a very few rod-shaped organisms was determined in the substance.

The thymus showed slight degenerative changes, as did also the tail of the pancreas.

To recapitulate: There was found post-mortem a generalized parenchymatous degeneration of the organs, a sclerosis of the pancreas, an acute enteritis, and a commencing cirrhosis of the liver.

The perivascuclitis, the cirrhosis of the liver, together with the sclerosis of the pancreas, approached the changes found in senility. Finally, it is to be especially noted that there were no other evidences of syphilis.

The presence of a chronic pancreatitis in a new-born child is, I believe, in the absence of syphilitic manifestations, of sufficient rarity to deserve at least passing notice. The usual cause of connective tissue overgrowth in this organ is, of course, syphilis, and when it was found I was somewhat inclined to believe that we might have been dealing with a case of that disease, in spite of the fact that there were no other signs.

In looking up the subject more carefully, however, I have found that the presence of a connective tissue hyperplasia in the pancreas has been noted in the new-born in various conditions. Kasahara,¹ in the Pathological Institute of the University of Berlin, made some particularly interesting studies of the condition. His article gives a list of cases in which this condition was found at post-mortem, and among his cases he was able to tabulate twenty-two in children whose ages varied from a few months to several years.

Among these children he found six in whom there was a marked hyperplasia of the pancreatic connective tissue, and four in whom it was moderately increased. The remaining twelve cases showed but the normal amount. In all of these cases the author says that the diseases causing death could in no case have been the cause of the interstitial pancreatitis, and he also excluded syphilis by most careful search for other signs. He is somewhat disposed to accept the condition as a

¹ Ueber das Bindegewebe des Pankreas bei verschiedenen Krankheiten. M. Kasahara. Kioto, Japan.

physiological one, and calls attention to the relative richness in connective tissue at times found in the pancreas in childhood.

The diseases which caused the death of these children were very dissimilar, as the subjoined tabulation shows:

CASE I. Child, aged eight months; cause of death, diphtheritic colitis.

CASE II. Child, aged two months; cause of death, catarrhal gastro-enteritis, hemorrhagic parenchymatous nephritis, with thrombosis of the left renal vein.

CASE III. Child, three months; cause of death, bronchopneumonia and atelectasis.

CASE IV. Child, aged two and one-half months; cause of death, catarrhal enteritis and pulmonary œdema.

CASE V. Child, aged one and one-half year; cause of death, marasmus.

CASE VI. Child, aged six months; cause of death, catarrhal enteritis, bronchitis, bronchopneumonia, parenchymatous nephritis.

CASE VII. Child, aged one and one-half year; cause of death, catarrhal gastro-enteritis and atelectasis.

CASE VIII. Child, aged eight years; cause of death, phthisis pulmonalis.

Bacteriological Examination. At autopsy cultures were made from the heart's blood, left lung, spleen, liver, peritoneum, brain, contents of the ileum, and the bile.

The staphylococcus pyogenes aureus was recognized by the color of its colonies and its staining and culture peculiarities in the heart's blood, spleen, and brain.

The bacillus ærogenes lactis was similarly determined in the heart's blood, spleen, and peritoneum. The latter was also found in plates made from the contents of the ileum.

From the bile two micro-organisms were obtained, the one a long bacillus forming gas with glucose, and turning litmus milk white without coagulation. This bacillus did not liquefy gelatin, did not stain by Gram's method, and was non-motile. In all its peculiarities it resembled the bacillus ærogenes lactis. The other bacillus found in the bile was a typical growth of bacillus pyocyaneus. Its identity was determined by the characteristic waving motion, by the deep bluish-green staining of the media, by the dark-blue color which it produced in strongly alkaline media, and by the rapidity of its liquefaction of gelatin.

From the liver tissue there were obtained the bacillus ærogenes lactis, the staphylococcus aureus, and the bacillus pyocyaneus.

In the left lung only the staphylococcus aureus was found.

A guinea-pig was inoculated with fresh bouillon culture of the staphylococcus aureus. It died the next day, and growths were obtained from all its tissues. The lesions were characteristic. Another pig was inoculated with the bacillus ærogenes lactis, and died within twenty-four hours. Pure cultures of the micro-organism were obtained from its tissues.

A third pig subsequently inoculated with the bacillus pyocyaneus died within twenty-four hours. Cultures were obtained from all its tissues.

It appears, therefore, that these three micro-organisms, which were dis-

tributed more or less generally through the tissues, were without exception virulent.

To recapitulate: There were three acute infections, two of which, the bacillus ærogenes lactis and the staphylococcus pyogenes aureus, were general, while the third infection, due to the bacillus pyocyaneus, was local, it being found only in the tissues of the liver and in the bile. That all three were virulent was proven experimentally.

The comparatively recent time of making the post-mortem, together with the marked localization, would seem to do away with any question of post-mortem invasion of the bacillus pyocyaneus. Also, the presence of the bacillus ærogenes lactis in the heart's blood would prove that its invasion was ante-mortem, as otherwise, though in a normal inhabitant of the intestine, it would not have been found in the heart in the absence of advanced putrefaction, since it is a non-motile bacillus.

The bacillus pyocyaneus has been known since 1882, when Gessard, "La Pyocyanine," *Thèse de Paris*, for the first time proved that the blue or green stain at times noticed on surgical dressings, and which, as early as 1860, had been isolated in the form of a coloring principle by Fordos (*Compt. rend. Acad. des Sciences*, 1860), was due to this bacillus, which he for the first time isolated in pure culture. For a long time subsequently, however, the organism was considered as a saprophyte, and even after it was shown as the probable cause of local or external pathological conditions it was still held, as, for instance, by Schimmelbusch, that it was limited in its action to the exterior of the body.

Many observers have noted its presence in abscesses of the ear and mastoid disease, and it also has been found in the pus of wounds upon the surface of the body. Its occurrence, however, upon the surface of the body cannot be considered common, as Jakowski was only able to find it twice in 200 cases.¹ It has also been found in tubercular cavities by Koch. Babes² reported a localized infection of the umbilical cord as due to it. Other investigators have recently found it within the body, as, for example, Barker (*Journal of the American Medical Association*, 1897), who determined its presence in an ovarian abscess, and Lartigau,³ in purulent peritonitis. Charrin, 1894, reported its presence associated in puerperal fever with a few streptococci. Ehlers⁴ was the first to call attention to its power of producing general infection. Brill and Libman,⁵ in reporting a case of pyocyaneus bacillæmia, called attention to the great danger of post-mortem invasion, both by the bacillus pyocyaneus and the colon bacillus, due to their motility. According to these authors, there are only five cases worthy of credence, none having

¹ Zeitschrift f. Hygiene, vol. xv. p. 475.

² Journal of Experimental Med., 1898, vol. iii.

³ AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Aug., 1899.

⁴ Gaz. Med., Nantes, 1895.

⁵ Hosp. Tid. Kjobenh, i. 1890.

been reported previous to 1893, and they cite the belief of Schimmelbusch, that although local infections and resulting toxæmias were undoubtedly caused by it, yet it could not invade the organism.

The five cases considered by them as cases of general infection of this bacillus are as follows:

First, a case reported by Williams and Cameron in a child aged seven months. In this case no cultures were obtained from the blood ante-mortem, but post-mortem the capillaries of the liver, kidneys and spleen were found blocked with minute bacilli, proving by culture to be the bacillus pyocyaneus. The organs showed parenchymatous degeneration. Autopsy was made soon after death.

The second case, reported by Finkelstein, was a child, aged three months, with hemorrhagic diathesis. Blood cultures were made from the vein two days ante-mortem, showing the bacillus pyocyaneus and the colon bacillus. The presence of the bacillus pyocyaneus was determined in the stools and also in the blood aspirated one-half hour post-mortem. This is the first case in which the bacillus pyocyaneus has been found in the blood by culture during life.

The third case reported by Blum¹ from the clinic of Professor Escherich was that of a syphilitic child presenting the symptoms of fever, loss of weight, and also the presence of blood-filled vesicles on the great and second toes. Auscultation revealed a loud, rough systolic murmur. Death occurred after thirteen days. The post-mortem in this case showed a lobular pneumonia, the liver changes usually found with syphilis, pericardial effusion, and a thickening of the edges of the bicuspid valves. In this case the blood drawn from the ear on the day before death showed the presence of the bacillus pyocyaneus. The blood taken from the heart one and one half hour after death also showed the presence of the same bacillus by culture. Endocarditis was also experimentally produced in a rabbit.

The fourth case, reported by Czerney and Moser, a child, aged seven days. Blood cultures from the finger tips showed the bacillus coli communis and bacillus pyocyaneus. This case may be considered doubtful because of the method used. But many control experiments were made.

The authors report their case as the fifth, and claim it to be the second in which the bacillus was found during life in a manner excluding doubt. They also claim it as the first case reported in an adult, and thus show that the infection is not confined to infancy.

Bleeding from some portion of the body of the new-born child is not a very rare condition if we include the frequent cases of slight bleeding from the cord or the umbilical ulcer after separation. This form of hemorrhage is not associated with any general symptoms, unless the

¹ Centralblatt f. Bakteriologie, Parasit. und Infektions-Krankheit., February 10, 1899.

amount of blood lost be so great that a resulting acute anæmia be produced. If such be the result it means, in the vast majority of cases, that the medical attendant or nurse has been negligent, such hemorrhages occurring usually because of the patulosity of the umbilical vessels, which may be usually easily controlled by firm pressure and hæmostatics. The so-called precocious menstruation may be considered of the same type, as it is usually not associated with constitutional reaction.

In contradistinction, however, to this slight local bleeding we meet with a condition more rarely in which, as in the case reported, the bleeding is associated with general symptoms and the clinical picture is of an infectious process.

That this latter condition, to which the term hemorrhagic diathesis should be limited, is not very rare, is shown by the statistics of Ritter, who met with it 190 times in a series of 13,000 births at the Prague Lying-in-Asylum, and Epstein in the Prague Foundling Asylum, who pronounced it present in 8 per cent. in a series of 740 infants. Hecker, quoted by Osler, states its frequency as 1 in 500. Buhl's statistics are the same, while Spiegelberg gives it as 2 in 5000 and Genrich as 1 in 2800. The statistics of the Lying-in-Hospital in Boston are given as 0.57 per cent. in a series of 7225 cases.

Though authorities have agreed that the occurrence of hemorrhagic manifestations of a severe grade is less frequent in private than in hospital work, a fact which would certainly indicate the infectious nature of at least a portion if not all cases, still its causation until very recently has been attributed to syphilis or some local lesions, as ulcers of the intestinal tract. The comparative rarity, however, of any syphilitic manifestations in hemorrhagic cases, 2 per cent. to 6 per cent., according to Epstein, Ritter and Townsend, shows conclusively that it cannot be the cause in the vast majority of cases. Further, in Townsend's series of fifty cases, quoted by Rotch, there were in the nine cases examined by post-mortem no ulcerations of the mucous membranes or blood-vessel lesions found, and Duser,¹ quoted by Holt, found in a series of twenty-nine post-mortems but thirteen cases in which ulcerations of the mucous membranes were present, nine being in the stomach and four in the intestines.

Thus the relative infrequency of the occurrence of syphilis and ulcerative conditions in the cases of hemorrhage which have been reported may lead us to question their causal relationship even when present, and the doubt is still further increased when one remembers the statistics of Mracek, who found in a series of 132 cases of congenital syphilis but 14 per cent. the subject of hemorrhage.

¹ Thèse de Paris, 1889.

Ulcerations may, of course, be the cause of the hemorrhages in the few cases in which they are found, but authorities seem disposed at present to consider such cases as primarily septic, the ulcerations very probably being due to septic emboli predisposed to by the relation of the vessels of the stomach and duodenum, the thrombus being situated in the umbilical vein.¹

Sepsis due to the ordinary pyogenic organisms seems at first sight, indeed, to play a more important causative rôle in the production of this diathesis than the previous conditions, since in an examination of 61 cases of sepsis Epstein found hemorrhagic conditions associated in 29, and Ritter in a series of 190 cases found the same association twenty-four times. That the relationship which, judged from the above statistics, might seem to exist between ordinary septic infection and hemorrhagic manifestations cannot be considered as valid is shown by the statistics of the Sloane Maternity Hospital, as follows: In a series of 1500 cases of labor in that institution during a period entirely free from septic trouble of any kind there was no case of hemorrhage observed, but in a subsequent series of 225 deliveries observed during the presence in the house of septic cases there were eight babies who developed hemorrhage. In the cases of hemorrhage observed, however, there were none of the usual septic manifestations, while in the cases of sepsis of the ordinary variety, present at the time, there was an entire absence of any hemorrhagic manifestations.

It would seem probable, therefore, that the etiologic rôle played by the usual type of pyogenic infection in the production of cases of hemorrhage can only be considered as one of predisposition.

As has been said, syphilis was formerly considered to be the cause of hemorrhagic disease, but the absence of syphilitic signs and history in many of the cases reported have led Neuman and Ritter and others to doubt the causal relationship and to relegate its influence in the production of these cases to that of predisposition. That syphilis has an important influence in predisposing to infection is well known, and has been emphasized by Epstein² and proven bacteriologically by Kassowitz and Hochsingen, and by Chotzen and Kolisko.³

Rotch thinks that the hemorrhages under discussion are probably symptomatic of different specific diseases, and the fact that the disease is self-limited in the cases that recover seems to point strongly to the same conclusion. It is a very interesting fact that cases after recovery show no tendency to a recurrence or to hemorrhage from the umbilicus on separation of the cord, even though it had been one of the bleeding-points during the course of the disease. Holt states also that circum-

¹ Landau, Ueber Melena der Neugeborenen, Breslau, 1874.

² Oesterr. Jahrbücher f. Pædiat., 1876.

³ Neumaun, Archiv. f. Kinderheilkunde, 1890.

cision has been performed a few days after the cessation of bleeding without any resulting hemorrhage.

From the different cases of hemorrhage of this variety which I have found in the literature the general symptom-complex seems to agree well in general with the description given by Lartigau,¹ who says that the symptoms resemble other better known forms of septicæmia and some of the acute febrile diseases. He gives the symptoms at the outset as weakness, prostration and fever. Pulmonary disturbances and pleurisy are often present. Epistaxis is noticed at times, and tympany is present as a rule. Splenic enlargement he seems to consider quite constant. Diarrhœa and vomiting are present, and both at times contain blood. Cutaneous changes noticed are of the form of bullous eruptions or petechiæ, or rarely a papular rash may be observed. The eruption usually occurs on the trunk, limbs, or scrotum, and may appear either early or late. Death occurs in from forty-eight hours to five days as a rule, though sometimes later. Loss of weight is constant in cases which live long enough to show it.

The previous condition of the children who present this grave form of hemorrhage differs so widely that nothing can be learned by its consideration. Thus some cases before the development of bleeding have shown general weakness and intestinal disorders, and others, as was true in the present case, are perfectly healthy until the onset of the acute symptoms.

The situation of the hemorrhage may be in any tissue or organ of the body, but usually is found at the umbilicus or in the mucous membranes of the stomach or intestines or beneath the skin. Rarely internal hemorrhage may destroy the life of a child without any external evidences of bleeding. The onset is in the majority of cases sudden, and occurs usually before the twelfth day, though cases have been reported as late as the sixth week, and Lartigau,² in investigating an epidemic of dysentery due to the bacillus pyocyaneus, found three fatal cases in children aged nineteen months, five years, and four years respectively, and one fatal case in a man aged thirty-five years.

The cases that recover do so usually in a very few days, but no series of cases will present probably more than a third of the number resulting in cure. Townsend in a series of 709 cases found a mortality of 79 per cent.

The cause of death usually seems to be loss of vital force rather than an acute anæmia. But in the present case the latter seemed to me to be the cause of death, since the amount of blood lost was so great.

If we conclude, as seems to be justifiable from the symptoms presented by this child in connection with the post-mortem conditions and

¹ Brill and Libman, AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Aug., 1899.

² Journal of Experimental Medicine, 1898, vol. iii.

bacteriological findings, that it was a true case of infection by the bacillus pyocyaneus, we have still to consider the question, to me the most interesting of any which the case presents, namely, how did infection occur in this instance without being operative in the other babies present in the wards of the hospital at that time and living under the same hygienic conditions? Unfortunately, the facts at command are not sufficient to form a basis for conclusions, and I can only present an inference which, while supported by absolutely no proof, still seems to me to be the most plausible explanation of the development of a sporadic case of this type.

In the consideration of cases of infection in general we can divide them all into two great groups: first, those in which the infection arises from internal causes, auto-infection, and, second, those arising from external causes. To consider the first group, or auto-infections: With regard to this particular case we may assume, I believe, that if the infection took place from within the source would be found in the intestinal canal, since the development of the most marked symptom, the hemorrhage, developed in that locality, and also since no collections of pus containing the bacillus in question were found which might in this case, as in several which have been reported, have served for the focus of infection.

In a somewhat hasty review of the literature of this bacillus I have been unable to find it as a usual inhabitant of the intestinal canal of children, and Kossel¹ says that among his many examinations of the bacteria of the normal and pathological intestinal canal he has never, except in one instance, found this organism. In the case in which he was able to determine its presence, that of a child, aged four weeks, the symptoms presented were those of diarrhœa, anorexia, and great weakness. The diapers, on exposure to air, became dark green, and the stools were dark green and slimy. The bacillus pyocyaneus was found in great numbers in the stools, with a great diminution of the usual intestinal bacteria. Green vomit developed later, and death took place thirteen days after admission to hospital. In this case pus was present in the right middle ear and the right nasal cavity. From it, and also from the secretions of the larynx and trachea, there were obtained pure cultures of the bacillus pyocyaneus. Kossel believed that the digestive disturbances which caused the child's death were due to this organism derived from the ear.

In this connection the stools of six healthy babies at the Maternity Hospital were examined for the presence of this bacillus, but with negative results, and while this is, of course, when taken alone, proof of nothing, still it is in accord with the investigations of Kossel just men-

¹ Zeitschrift f. Hygiene, xvi., 2.

tioned, and also has the support of Lartigau,¹ and of Calmette, whom he quotes. Booker² also says that its presence is very exceptional in pathological conditions of the digestive tract. Kranhalls³ also speaks of its rarity in the same connection.

If, then, it may be assumed from the foregoing reports of various investigators that the bacillus pyocyaneus is not a normal inhabitant of the intestinal tract, infection must have arisen from without, from the air, hands of the attendants, or by means of the food and water. Prenatal infection through the placenta, as proposed by Neuman,⁴ to explain cases of infection developing in previously healthy infants shortly after birth, cannot be considered as possible in the present case, the period between birth and the development of symptoms being too long.

While the air of the wards was not examined, it hardly seems probable that this was the source, as only this one child was affected, and also since Symmes in Bergmann's clinic was only able to find this bacillus present in the air once in a long series of examinations, and only then when there was much green pus present in the wards.

It seems to me hardly likely that the infection could have been carried by the hands of the doctors and nurses in view of the careful technique in vogue at the Maternity Hospital, and also because it is very improbable that this child would have been the only one to suffer had its infection had this origin.

As to food infection, the fact that the child was breast-fed would seem, in view of the well-known sterility of breast-milk, to render its relation as a causal agent impossible.

The usual sources of infection having thus apparently failed to explain the infection, I am in doubt as to its solution, and only offer the following inference as a possibility. It is a well-known fact that the occurrence of the bacillus pyocyaneus upon the skin and in the saliva is not very rare, the investigations of Mühsam resulting in its detection upon the skin of the axilla and in the inguinal regions in seven out of fifteen cases examined, while Pansinia and Frick⁵ have also found it present in saliva and sputum, and Eberth (*Medicin. Centralblatt*, 1873, and Virchow's *Archiv.*, 1875, lxii.) determined it in sweat, as did also Audouard.⁶

Bearing the above-mentioned facts in mind it has occurred to me that possibly the explanation of the infection might have been found by bacteriological study of the nipple surface of the mother, both because the nipples form very good culture grounds if not carefully cared for, and because the aseptic condition in the puerperium depends more upon

¹ Journ. of Experimental Med., 1893, vol. iii.

² Johns Hopkins Hosp. Reports, vol. vi.

³ Compt. rend. Soc. de biol., October, 1897.

⁴ Archiv. f. Kinderheilkunde, 1890.

⁵ Virchow's Archiv., cxvii., p. 424, and cxvi., p. 266.

⁶ Journ. de Medicin de l'Ouest., 1879.

the intelligence of the woman herself than does any other portion of the aseptic technique. Moreover, it is to be remembered that among the class of women in the wards of our maternity hospitals the custom of moistening the nipple with saliva before suckling is not very uncommon, which fact, in the light of the investigations by Virchow and Audouard, may render my inference still more plausible.

In conclusion I must confess to a certain dissatisfaction in reporting this as a case of pyocyanic infection for the following reasons:

1. Because of the triple infection.
2. Because of the very localized area in which the bacillus pyocyaneus was found in comparison with the distribution of the other two organisms.
3. Because it was not detected in the alimentary tract, a situation where one might have expected to have found it because of the development of the dominant symptom in that locality.
4. Because I failed to attempt its detection in the blood during life.

In spite of the points just mentioned, which may seem to some to be of sufficient gravity to invalidate the case, I still believe it to have been a true case of infection by the bacillus pyocyaneus for the following reasons:

1. The negative history of the first sixteen days of life, followed by an acute illness, the symptoms of which can be explained only by the assumption of an infection.
2. The complete absence of any pathological lesion sufficient to cause death.
3. The presence of the bacillus pyocyaneus in the bile and liver tissue in a condition of virulence. As previously stated, I find that all investigators are in agreement as to the rarity of the occurrence of this organism within the body, and while future study may demonstrate its presence more frequently than we now suppose, I do not believe that it will be found to be a harmless inhabitant of the human body.
4. The association of hemorrhage as a symptom, the presence of the bacillus pyocyaneus having been established, seems to me to afford at least strong presumptive evidence that it was the dominant infection.

DISTORTION OF THE AORTA IN POTT'S DISEASE.

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THERE appeared in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES for January, 1897, a description by me of a striking instance of this condition. The interest with which it was received by specialists

induces me to publish an account of two other cases met with in the dissecting-room in the season of 1899-1900. A further reason for doing so is that the case already published and one of the new ones present a greater distortion than I remember ever to have seen figured, and that the three together seem to explain the cause of the distortion and also hint at some of the dangers to which this condition exposes the circulation. I shall call the case already published A, and the new ones B and C.

The following is a brief recapitulation of the more important features of A :

The spine, that of a white man, aged fifty-one years, presented an extremely sharp angle at the junction of the thoracic and lumbar regions. The greater part of the lumbar vertebræ were fused with the lower dorsal ones. Consequently the spine was much shortened. The aorta descended, gradually crossing the column from left to right, to the head of the right ninth rib; then turned suddenly, making a long and almost horizontal curve with a deeper posterior concavity across the spine to the left, whence after another curve it reached the middle line a little above the promontory. Thus there may be said to have been three curves with two angles between them.

CASE B. Male, white, aged seventy-five years. The spine presents a sharp bend at the junction of the thoracic and lumbar regions, with but little lateral or rotary distortion. The body of the tenth thoracic vertebra is somewhat compressed, being a little smaller than the one above it. Compression and distortion are more marked in the eleventh, the lower border of which almost touches the top of the body of the fourth lumbar. The bodies of four vertebræ, namely the twelfth thoracic, the first, second and third lumbar, have been practically destroyed, at least at the front, and the broken-down mass has solidified firmly. The fourth and fifth lumbar vertebræ are normal. As an effort at compensation after the cure the dorsal region above the lesion is slightly convex in front. The angle formed by two lines drawn through the centres of the bodies is about 70° . The prominence of the hump is made by the spine of the first lumbar. The sacrum consists of six pieces. The body of the first sacral vertebra is raised so as to bring the promontory above the line of the true pelvis. It is not impossible that this also is an effort at compensation for the loss of height. The sacrum is very long and flat, the coccyx being inclined strongly forward. The length of the spine in a straight line from the top of the atlas to the coccyx is 54 cm., and that to the promontory 40 cm. The average of the latter measurement in the male is probably from 60 to 63 cm. The length of the cervical region is 13 cm., the average being 13.3 cm., and that of the sacrum and coccyx 17.3 cm., both being measured along the anterior curve. The last measurement in specimen A is 17.5 cm. As this measurement is for most purposes a perfectly useless one, and extremely variable, I have not made enough observations to know the average, but I feel pretty safe in saying that it is not over 15 cm. Thus specimens A and B have this lengthening of the sacrum in common. The latter, so far as the spine is concerned, is much less interesting than the former. The angle is less acute, the destruction less, and the length greater. On the other hand

the distortion of the aorta seems to be even more remarkable. The vessel descends from the arch along the left of the fourth, fifth and sixth vertebræ. It then begins to incline to the left, crosses the head of the eighth rib and makes the first bend between the ninth and tenth ribs, the concavity being from 1 to 1.5 cm. beyond the spine. The aorta then runs forward, downward, and to the right, enlarging considerably. The convexity of the next bend is just to the right of the middle line opposite the seat of caries, between the bodies of the tenth thoracic above

FIG. 1.

Case B.

and the fourth lumbar below. The entering angle of this bend on the left and behind is a very sharp one. The aorta then runs horizontally to the left, and at the same time a little backward along the top of the fourth lumbar vertebra. Near the back of the left lateral aspect of the spine it describes another bend, which is more gradual and graceful than the preceding ones. After this it runs again forward to the middle line, where it divides into the iliacs opposite the upper half of the fifth lumbar vertebra. Thus there are four curves with three angles. The right

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iliac artery continues the course of the aorta, while the left one makes a sharp bend to the left, so that it may be called recurrent. The aorta is throughout remarkably large. A very important point is the egg-shaped enlargement of the transverse portion between the first and second bends. The coeliac axis springs from near the middle of this curve, and the superior mesenteric from just before its end. While the origin of these two large vessels might account for the diminution of the calibre of the aorta at the end of this curve, the cause of the dilatation at its beginning is not clear. The right renal artery arises from the con-

FIG. 2.

Case C.

vexity below the bend, and the left one a little sooner, just below the entering angle. (Neither of these shows in the figure.) The latter is so placed as to imply that the circulation of the left kidney might be carried on at a disadvantage. There is a moderate gradual diminution of the calibre of the aorta from this point.

CASE C. Male, white, aged fifty-nine years. The disease is in a higher part of the spine than in the others and the lesion less severe. The caries involves the lower part of the seventh thoracic and probably the upper part of the eleventh and all between these, so that there is

but about 1 cm. between these two vertebræ at the front. The prominence of the hump must have been made by the seventh, eighth, and ninth thoracic spines. There is a small excavation, not a part of the general destruction, on the left of the column, just in front of the head of the tenth rib. The coccyx is lost and the lower part of the sacrum injured, but the latter shows no sign of the elongation which is so striking in the other two specimens. The distance in a straight line from the top of the atlas to the promontory is 39 cm. The length of the neck is 12 cm., and that of the loins 15.3 cm. As the average of the latter is 19.9 this spine is presumably a small one, and though the distance from the atlas to the promontory is 1 cm. less than in B, I think that the loss of height is almost certainly less. The angle of the lines through the centres of the vertebræ is probably between 100° and 105° . The aorta presents a much less striking distortion than in A and B. The irregularity is limited to the thoracic region, and, indeed, does not involve the lower part of that. The arch is uncommonly high in relation to the spine, the horizontal part ending opposite the third thoracic vertebra. Thence it describes a loop to the left, lying on the heads and necks of the ribs, till at the head of the sixth rib it begins to sweep forward to reach the middle line at the eighth vertebra, just above the angle caused by the disease. It then turns downward and descends nearly straight, but with a very slight curve to the left, to divide into the iliacs near the middle line opposite the upper part of the fourth lumbar vertebra. The deviated portion in the thorax was but loosely attached to the thoracic walls, so that during the progress of the dissection great care had to be taken to retain the aorta in its original position, which was done by driving strong pins on either side of it at several places. The changes in calibre of the aorta are very curious. The early part of the arch is extremely large, probably owing to an exaggeration of the dilatation commonly seen after middle life. There is a gradual diminution throughout the arch, which is rather suddenly accentuated at its termination. Again, there is a rather sudden diminution in the lower part of the deviated portion, so that the descending aorta has lost much before the large abdominal vessels are given off. The abdominal aorta seems smaller than usual, so that there is a striking disproportion between the beginning and the end of the aorta.

Now to compare the three specimens. The injury to the spine is very much the greatest in A and the least in C. The last is the only one in which it is confined to the dorsal region. Both A and B have remarkably long and flat sacra. In A the flatness extends through the coccyx; in B the latter is thrown forward so as to give the combined regions something of the normal shape. In spite of the greater deformity of A the distortion of the aorta is greater in B, which has one curve and one angle more. In C the distortion of the vessel is entirely above the lesion. Lannelongue¹ teaches that the simplest form of distortion of the aorta is a simple bend corresponding with that of the spine, and apparently that the more complicated forms are caused by the pressure of the abscesses. That distortion may and does occur through such

¹ Tuberculose vertebrale, 1888, p. 104.

pressure is beyond question. A beautiful instance is figured by Lanne-longue of a small abscess behind the aorta causing a sudden forward convexity of the vessel. But, if I follow him correctly, he implies that there is no other cause. Now in these cases, so far as I know, there were no abscesses, and even if one had been overlooked,¹ another more simple explanation is all-sufficient. It is that in case a number of the bodies of the vertebræ along which the aorta runs have been destroyed, the vessel can accommodate itself to the new conditions only by describing a series of folds. When the original relation between column and vessel has been lost, what else, so to speak, can the latter do? What determines the length and nature of each fold must of course vary with each case, with the degree and position of the lesion, and the point of least resistance. Thus in C the aorta is folded precisely as one would imagine it must be, with the exception that it is curious that the last part of the thoracic portion should have regained the proper position. I should have thought it more likely that it would only have reached the median line at the point of passage through the diaphragm. No doubt there was some restraining influence on the part just above it in this particular case that does not appear.

As to the size of the aorta: it is small throughout in A, large throughout in B, while in C it is large above and small below. In all three cases the aorta had been injected at its origin with starch mass, which, though not so distensive as some others, no doubt makes it abnormally large and acts particularly on the first part. Wishing to show the variations in the calibre of the aorta, I made a series of measurements of both B and C, but later discarded them. It is impossible that they should represent the original size, and unlikely that the distention should be equal throughout. Moreover, owing to the slow hardening of the mass, the vessel at times was more or less compressed in certain directions. Altogether it seemed to me more accurate to give general statements. The injection serves to make more evident the instances of dilatation of parts of the vessel, as for example, that at the first transverse bend of B, which are not easy to account for. On the other hand, injection probably tends to efface folds in the walls of the vessel.² The dangers to which the circulation in B is exposed have been alluded to. Were the aorta undistended some of the entering angles would probably be even sharper. It is well known that death

¹ I regret that I cannot speak with absolute certainty on this point. The fact is that when an important anomaly or pathological condition is observed in the dissecting-room the only thing to do for its proper description is to remove the body. But there are many reasons why this may be a very undesirable thing to do. If it be left, even with the best will of all concerned, the different points are rarely observed and noted at the proper time; and the proper time being passed they are often lost for good.

² The shadow in the figure of specimen C has exaggerated the depth of the bend below the deviated position.

is thought to occur from the sudden closure of the aorta at such bends. In view of the influence the condition of the aorta must exert on certain parts, and of the danger it may offer to life itself, these specimens are more than anatomical curiosities.

THE VALUE OF PEDICLED FLAPS IN INJURIES OF THE HAND.

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THE injuries met with in the hand which result in the destruction of the skin and subcutaneous tissues, leaving the tendons and all or some of the bones and joints intact, may in many instances be repaired by judicious treatment. These injuries are commonly produced by various kinds of machinery and by burns and frost-bites. It is not the purpose of this paper to discuss the etiology of such injuries in detail.

Amputation is frequently resorted to in contused lacerated wounds of the hand, whereas burns are usually allowed to get well of their own accord; that is, plastic operations are not often performed. It is for such cases that the pedicled flap method is to be recommended. No attempt will here be made to review the literature on other methods of skin-grafting, such as Thiersch's and the free flaps.

Elasticity and resistance are required of the skin in the palm of the hand, and neither one of these conditions is furnished by the Thiersch or free-flap method, although both of these methods may be used successfully on the dorsal surface of the hand. Enderlen, in his article, has shown that in Thiersch's graft the elastic fibres all die and that only a very thin layer of epithelial cells remains. It is also insufficient because of the ulcers that form when the hand is used. He also cites cases where free flaps were used and the microscopical examinations of specimens showed that parts of them died, resulting in the formation of connective tissue. Fenger permits me to report here a case of this kind. He placed a free flap over the metacarpal bones from which the fingers had been removed, and found that in time the flap shrank decidedly, and when the stump was used small blisters formed, resulting in ulcers. Microscopical examination showed a considerable increase in quantity of connective tissue. It finally became necessary to replace this with a pedicled flap (see Fig. 1), which terminated favorably. It was Dr. Fenger who, so far as I know, first applied the method which I used in the cases to be reported. I am also greatly indebted to him for the privilege of reporting two of his cases. His first case was

operated upon about ten years ago, and, as seen in the figure, the attempt was made to save the palm of the hand so that the thumb would have something to press against. This was entirely successful.

The second case was operated upon for an extensive burn of the palmar surface of the hand and all of the fingers but one. The result was very good.

Because of a series of photographs which I have had taken, showing each step of this operation as performed by Dr. Fenger, I report my last case in detail.

FIG. 1.

CASE I.—History. J. W., aged thirty years, colored; family history negative; physical examination negative. Patient was burned when he was six months old by accidentally getting his right hand into a grate fire. The hand remained untreated. When he presented himself I found the fingers in extreme flexion, the thumb in flexion and pronounced adduction, caused by cicatricial tissue. All of the joints were slightly movable and the tendons intact and not adherent. (See Fig. 2.) The function of the hand was almost entirely lost. All he was able to do was to hold small objects between the thumb and the nails of the first and second fingers. The development of the hand was somewhat arrested, the fingers being somewhat shorter and the hand slightly smaller than the left hand. There were no cicatricial ulcers present.

Preparation of Patient. The hand was prepared two days before the operation by cutting the nails, scrubbing with green soap and water,

freely using alcohol, scrubbing with 1 : 1000 bichloride and then putting on 1 : 4000 wet bichloride dressings, which were changed every six hours. The skin over the right hip was prepared in a similar manner at the same time.

FIG. 2.

Before operation.

First Operation. 1. The cicatricial tissue was dissected off of the palm, fingers, and thumb. This left a wound extending from the carpo-metacarpal joint to the distal phalanges of the fingers and thumb. (See Fig. 3.) The deformity of the thumb was corrected, but the new posi-

FIG. 3.

Cicatricial tissue removed.

tion was with difficulty retained. The first finger was flexed and held by the shortened anterior ligaments of the first interphalangeal joint, which were ruptured in extending the finger. The hand was now placed upon the hip and incisions made in the skin as guides. The upper flap was made wide enough to cover the denuded space above the first row of

digital furrows, having an anterior and posterior pedicle, the distal end of the thumb passing through the posterior pedicle. The anterior flap passes over to the crest of the ilium. The hand was now placed under this flap and the fingers separated and incisions made opposite the middle of the distal phalanx of each as guides. The hand was again removed and the pockets made, one for each finger, leaving attachments between the fingers for nourishment and better immobilization of the fingers. The hand was now placed in position and the upper and lower flaps united, as well as the lower border of the lower flap, to the fingers and the upper border of the upper flap to the edge of the skin of the wrist. (See Fig. 4.) There are several important precautions to be taken in this step of the operation, namely: 1. Not more than a quarter of an

FIG. 4.

Hand in place.

inch of subcutaneous tissue must be taken, because a thicker flap is clumsy and more difficult to unite to the skin of the hand. However, if more is taken, it will become absorbed in time. 2. There must be no tension on the pedicles. 3. The skin must have some subcutaneous tissue attached, or its vitality is endangered. 4. The edges of the skin of the hand must be undermined for at least one-quarter of an inch so as to allow of easy approximations.

Dressing. Sterile gauze is placed back of the hand and gauze drains back of the fingers. Next, a large quantity of gauze is placed over the hand, which is now in its place, and adhesive straps applied so as to hold it in place.

Plaster Cast. A plaster cast is applied, extending from the shoulder to the glutea-femoral fold.

After-treatment. At the end of three days a trap-door is cut in the cast and the dressing changed. (See Fig. 5.) Boric acid solution is

FIG. 5.

Trap door.

FIG. 6.

Thumb liberated.

the strongest antiseptic used in these dressings. Gauze is reapplied and the door closed and held by a muslin bandage. This wound is dressed

every third day. The patient was able to sit up and walk about at the end of one week.

Second Operation. The second operation was performed on the eighth day, and consisted in dividing the inner pedicle to where the thumb protruded. Part of this pedicle was united to its former place. The flap was united to the thumb. (See Fig. 6.) A new cast was applied because of the broken condition of the old one. After-treatment the same as before.

Third Operation. On the sixteenth day the remainder of the posterior pedicle was divided and the flap stitched to the radial side of hand and index finger. Now, the flap is nourished from the anterior pedicle and interdigital septa and through the new adhesions formed. (See Fig. 7.) Dressing applied as before.

FIG. 7.

Medial flap divided.

Fourth Operation. On the twenty-second day the inner pedicle was divided and stitched to the ulnar side of the palm and little finger. The interdigital septa were divided, and thus the hand was liberated.

The wound in the hip was treated in the following manner:

1. The granulations were removed with a sharp curette.
2. The skin was dissected back for a distance of two to three inches, and tension sutures and stitches applied so as to narrow the denuded space. The thigh, having been prepared the day before, furnished Thiersch grafts for the hip. Dressings applied, no cast. Dressings applied to the hand.

The Thiersch grafts took very nicely and on the eighth day the superficial epidermis, containing pigment, was shed, leaving them perfectly pale. The flap was reasonably thick and the subcutaneous tissue plus

granulations separated the fingers. (The wound in the hip before grafting is shown in Fig. 8.)

FIG. 8.

Wound on hip.

FIG. 9.

Hand after operation.

Fifth Operation. On the twenty-seventh day the bridges of flap between the index and second and between the little and ring fingers were divided and sutured to their respective edges of the finger.

Sixth Operation. On the thirty-second day I divided the bridge between the ring and second fingers, suturing as before.

Whenever an edge of flap was united to the edge of normal skin, it was necessary to dissect back the skin on the fingers or palm and freshen the edges and bevel those of the flap below, so that good coaptation

FIG. 10.

would be possible and primary union assured. This was done in all cases, and I also desire to state that it was not possible to avoid infection in any of my cases, but by frequent dressings and proper drainage this did not interfere with the final result, which was good. The joint opened in the index finger became ankylosed, as it did in the little finger of Case II. The usefulness of this hand has been very much improved, and the patient is now (three months after the operation) able to partially flex and extend the fingers. (See Fig. 9.) This was also the case with Fenger's patient. (Figs. 3, 4, 5 and 6.)

CASE II. The second case, which I operated on three years ago for an extensive burn of the palm and dorsum of the right hand produced by a hot mangle, gave a fair result. In this case the flexor tendons of the little finger were injured, and she would be better off with the finger removed. Otherwise, she has a useful hand, being able to do all ordinary work.

CASE III. I am indebted to Dr. Eskridge for this case. The patient, a young man, aged eighteen years, white, was caught between two rollers and suffered the loss of the greater part of the skin on the palmar surface and a portion of the dorsal surface of the hand. In the palm the flexor tendons were freely exposed. I operated upon this patient, assisted by

FIG. 11.

Dr. Eskridge, making a single flap from the hip. The free edge of the flap was united to the radial side of the thumb and upper and lower edge of the palm. Twelve days later Dr. Eskridge divided the pedicle and stitched the flap to the edge of the skin on the dorsum of the hand. A part of the flap on the dorsum died, and it became necessary to apply a Thiersch graft. (See Fig. 10.) This gave a most complete result. There is no limitation of motion and the boy's hand is as useful as ever.

CASE IV. This case is one which I saw in consultation with Dr. Eskridge, and I desire to thank her for the privilege of reporting the case. Patient, a young man, aged twenty years, white, was injured in a crushing machine, causing a severe crushing injury to the fingers of his right hand and a laceration of the skin of the palmar and dorsal surfaces of

the hand. The fingers died as did the flaps on the hand. This left the heads of the metacarpal bones and greater part of the palm and dorsum of the hand exposed. After removal of the dead tissues the doctor grafted the stump in the hip with a lower pedicle. After several weeks the pedicle was lengthened, cut low down, and the flap turned up on the dorsum and sutured. (See Fig. 11.) A small area had to be grafted with Thiersch grafts. The result was good, giving the patient a stump to press the thumb against.

Where one desires simply to cover the palm, dorsum of hand, or the palmar surface of the thumb, flaps may be taken with freedom from the chest or abdomen. Where the palmar surface of the fingers has been destroyed, it is much better to have double pedicles, and these can best be obtained from the hip. Furthermore, this position is reasonably comfortable. I would say, however, that in young and old patients such a procedure would be very trying and scarcely justifiable:

SUMMARY. Advantages of this method:

1. Mobility.
2. Elasticity.
3. Certainty of taking.

INTERNAL HYDROCEPHALUS FOLLOWING CEREBRO-SPINAL MENINGITIS.

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THE following case of internal hydrocephalus occurring after cerebro-spinal meningitis is reported at the suggestion of Prof. Councilman and Prof. Mallory because the patient was under observation from the onset of the disease until its fatal issue, and because an autopsy was then performed. Through the courtesy of several other gentlemen, to whom I take this first opportunity of expressing my acknowledgments, an account of similar cases will be given, and following these a *résumé* of the literature, with a discussion of some of the pathological, but more especially the clinical, aspects of the subject.

CASE I.—Duration, eighty-nine days. R. C. was a young man, aged twenty-five years, with a good family history. He had had no illness except measles. July 10, 1899, he awoke in the morning with a headache, which became so severe at noon that he took to his bed. Later he vomited. The temperature was 102.4° F., the pulse 60 (see chart). I saw him for the first time July 12th. His temperature was then 101.4° F., pulse 60. Examination showed a medium-sized, undernourished young man, who was suffering comparatively little pain. Pupils, heart, lungs, and abdomen negative. July 13th, condition remained much the same. Widal and diazo reaction absent. Leucocytes, 4860.

Urine negative, except for a very slight trace of albumin. On the seventh day there was a leucocytosis of 28,000 and an abundance of fibrin in the freshly examined blood. Still more diagnostic was the stiff neck which appeared now for the first time. This was so pronounced that the whole body was raised if the head was lifted. Motion of the head sideways was also impaired. On the eighth day there was no headache, the neck was less stiff, and the leucocytosis had dropped to 17,200. In agreement with this was the temperature, which was now running at a degree's lower level, namely, 100° to 101° F. For the next five days it gradually, but irregularly, fell, and the pulse rose until, on the fourteenth day of the disease, it again reached 102° F., the pulse 80, and the leucocytosis 28,700. The following day it was noted that a watch could be heard only within six inches of the ears. No mastoid tenderness. Hyperalgesia of the fingers and toes was quite pronounced. Kernig's sign absent. The knee-jerks were slight, and the abdominal reflexes were now obtained for the first time. With the exception of a high temperature on the twenty-second to the twenty-fourth day, the patient's condition steadily improved for three weeks. He ate well,

CHART I.

was in good spirits, and had the merest trace of a headache. On the thirty-ninth day of his illness he vomited, and felt chilly and generally indisposed. His temperature rose once more to 101° F., and for two weeks it ranged between this point and the normal. Vomiting was repeated on the forty-second day, and again on the fifty-fourth, fifty-fifth, and fifty-seventh. Dr. E. M. Holmes kindly made an ocular examination on the fifty-eighth day, and reported normal, though rather pale, fundi.

As the patient had not improved for several weeks, he was moved into the country, where for sixteen days he gained steadily. During this time there was, with design, no record of pulse and temperature. He was seen daily, however, and it was thought that they rose but seldom above normal. About the seventy-fifth day he began to show less interest in what was taking place about him and said little. His appetite fell off and he vomited. Instead of going out-of-doors he kept his room. On the seventy-seventh day he was brighter, talked a good deal, and took a good amount of nourishment. The morning of the

seventy-eighth day found him as usual. He did have a "little time" vomiting, but this seemed transitory. Toward noon, however, he grew restless and thought he must pass water or have an evacuation, but when he got up little or nothing came, and he needed help to get back to bed. On one of these occasions he had a convulsion, during which he was partially conscious, but made incoherent remarks. Two hours after this attack he presented the typical picture of a cerebral anæmia. He was conscious, but his pallor was extreme. The pupils were equally widely dilated and responded only partially and sluggishly to light. No paralysis of any portion of the body was detected. The pulse was 108, regular, of fair volume, but low tension. Three hours later the pulse had fallen to 80, consciousness was completely lost, and he again became very restless. At 8 P.M. the pulse had dropped to 56. He was barely conscious and responded with "um," "ah" to questions. Toward morning the restlessness grew less. Dr. Walton saw him on this day and demonstrated that he was aphasic. Examination, including that of the eyes, was otherwise entirely negative save for a doubtful right-sided facial paralysis. By the eighty-second day, four days after the convulsion, the aphasia had disappeared. For the remaining nine days of his life he lay quiet in bed, spoke only when addressed, and was confused about well-known facts. Occasionally he was restless, complained of headache, and would moan in his sleep. He rarely vomited. At times the urine and stools were passed involuntarily. Rectal temperature was, as a rule, 98° F., and the pulse was about 60 to 70 and regular. He took comparatively little food, and, though he retained nutrient enemata well, gradually failed. On the eighty-eighth day there was in the evening a suspicion of Cheyne-Stokes respiration. By the following morning it was plainly present. He continued to grow weaker during the day, and toward evening almost imperceptibly died. The autopsy was performed by Dr. Mallory, who diagnosed an internal hydrocephalus on hearing the history of the case. His report is as follows:

Brain. Dura tense; convolutions flattened; vessels of pia moderately injected; pia slightly thickened in places along the course of the large bloodvessels; thickening more marked along the fissures of Sylvius and at the base of the brain, especially around the pons and medulla and in the neighborhood of the foramen of Majendie. The floor of the third ventricle bulges. On separating the two halves of the cerebrum the corpus callosum rounds upward. On opening the lateral ventricles they are found considerably dilated and filled with a clear, watery fluid, estimated at 70 to 100 c.c. The third and fourth ventricles also show a little dilatation. The ependyma of all four ventricles, but especially that of the fourth, is swollen and velvety to the touch; the normal markings in the floor of the fourth ventricle are obscured. Further section of the brain showed nothing remarkable.

Anatomical Diagnosis. Internal hydrocephalus.

The case, then, in brief, is one of very mild cerebro-spinal meningitis which ran a fairly typical course for one month, with beginning convalescence; then came a month of stationary condition, during which there was slight pyrexia and an occasional attack of what was fairly typical cerebral vomiting. The first half of the third month showed steady improvement, which, however, terminated in threatening symptoms—apathy and vomiting—and these lasted three days; then came a convulsion with cerebral anæmia, from which the patient aroused

slightly, only to pass gradually into an apathetic state, in which he succumbed on the eighty-ninth day of the disease. That the hydrocephalus had existed for some time; that an increase of the fluid took place about two weeks before the patient died seems probable, and that the pronounced cerebral anemia, which occurred on the seventy-eighth day of the disease, was due to the closure of the foramen of Majendie—all these suppositions seem consistent with the events recorded.

CASE II.—Duration fifty-two days. For the following record I am indebted to Dr. Edward E. Hooker, of Arlington. G. T. F., aged forty-three years, during an epidemic of influenza, was seized on January 23, 1897, with severe headache, photophobia, and backache, which extended to the hips. On January 30th the patient was in a mild,

CHART II.

muttering delirium, with hands picking at the bedclothes or holding the head as if in pain. Dejections involuntary during the next few days, and there was nausea and vomiting. On the twelfth day the temperature was subnormal, but it rose to 102.4° F. the next morning, when it was observed that there was slight twitching of the face and paralysis of the left levator palpebræ. On the sixteenth day the headache was worse, and the patient said his head felt swollen. Stupor, hiccough, nausea, vomiting, widely dilated pupils, partially closed eyes, and headache, together with involuntary dejections and a bladder requiring catheterization, constituted the picture on the nineteenth day. On the twenty-first day he began to moan, as if in agony, tossing and wringing his hands and rolling his eyes, and at times the thumb of his left hand turned in. The pulse rose to 140, and the hands were

cyanotic. This condition was temporary, however. For the most part of the time until the thirty-fifth day he lay in a semi-conscious state, though with almost constant moving of the feet. The thirty-fifth to the forty-sixth days were variable. For some hours he was very bright, during others delirious. Respiration was deep and occasionally sighing. Gradually the daily amount of food taken grew less; temperature and pulse fell from 100.2° to 97.8° F. and from 110 to 55 respectively, and the respirations, which were 55 on the evening of February 27th, dropped to 20 on the morning of March 9th. The forty-sixth day found him too dull to swallow properly. The pulse varied between 55 and 120 in three-quarters of an hour, and in a slightly longer interval of time the respirations fell from 40 to 24. From now on he steadily failed; no new symptoms appeared, but there was an intensification of the old. For the last few days of his illness there were marked irregularities in the cardiac and circulatory rhythm, which the chart brings out. On the day before his death Cheyne-Stokes phenomena appeared. On March 16th he died.

Autopsy by Dr. McGrath. Cranium: Sinuses normal; dura mater normal except for slight adhesion between it and the pia at the base of the brain. Brain: Weight, 1500 grammes. Removal necessitates separation of the slight adhesions above noted; the pia mater appears somewhat thickened over the base and upon the upper and lower surfaces of the cerebellum. Otherwise external aspect not remarkable. On section both lateral ventricles are distended with clear, colorless fluid, in amount about 150 c.c.; the ependyma seems somewhat thickened. On dissection the pia in the vicinity of the foramen of Majendie; is notably thickened. Otherwise the brain is not remarkable.

CASE III.—Duration ninety to one hundred days. M. C., laborer, aged thirty-two years, single, entered the service of Dr. George G. Sears at the Boston City Hospital on October 18, 1899. Previous history not obtained; had worked until about August 1st, when one hot day he had a fainting spell. At home a week with headache and lassitude; then he was able to walk about, but a week later began to grow worse. Occasionally delirious, and the headache at times was extreme. For two weeks he was somewhat deaf. Though in bed a month, his appetite remains good and the bowels are "all right." Two weeks ago he vomited. Examination: Well developed and nourished. Left pupil reacts slightly to light, right does not; pulse 76, regular, fair volume and strength; heart and lungs negative; abdomen somewhat retracted and tense, but not tender; liver and spleen normal; knee-jerks and plantar reflexes present. Grasp of the right hand weaker than that of the left, and there is a corresponding diminution in power of the right leg, with ataxia on standing. Urine contains no albumin. October 21st, good appetite and sleeps well; no pain; leucocytes, 19,000. October 23d, Dr. E. E. Jack reported a violent neuritis (choked), with hemorrhages and patches of degeneration. October 29th, feels very weak; no pain; eats well. November 3d, leucocytes, 6900. November 4th, feels "awful sick;" much headache; otherwise no change in his condition until death, on the following day.

Autopsy by Dr. Pratt. Head: Calvarium thin, especially the left frontal and parietal bones, which are in places not over 2 mm. thick; the dura is not adherent, but is very tense; the gyri depressed and flattened out; sulci effaced. The pia-arachnoid space over the cortex

contains little or no fluid. The pia is somewhat opaque, and there are lines and collections of opaque white material along the vessels. This is apparently the remains of a purulent exudate, which has been replaced by connective tissue. The pia-arachnoid at the base is markedly thickened, and the pons, medulla, and cerebellum are bound together by a delicate network of fibrous tissue. Cover-slip preparation from the opaque material upon the cortex shows neither bacteria nor pus-cells. The interpeduncular space is so distended with fluid that it forms a distinct spherical cyst, projecting about 2 cm. above the surface of the brain when placed with the cortical side to the table. Lateral ventricles greatly distended with clear, pale fluid, 80 c.c. in amount. When the fluid escaped the cyst at the base collapsed. The fluid had a specific gravity of 1010, and contains one-twentieth of 1 per cent. of albumin. The foramina of Monro readily admit the little finger. The ependyma is smooth; the underlying cerebral substance is not softened; the choroid plexus is not swollen and is natural looking. The third ventricle and the aqueduct of Sylvius are markedly enlarged. The basal ganglia, particularly the corpora quadrigemina, are compressed. In the superior fovea of the fourth ventricle is a small, firm, yellowish-white opaque mass, several millimetres in size, that completely occludes the ventricle at this point. The inferior fovea is covered by a soft, reddish substance, apparently young connective tissue, that closes the foramen of Majendie and the apertures of Mierzejewski. Culture from the fourth ventricle sterile. Brain: Weight, 1340 grammes. The right middle ear is filled with thick, tenacious pus. Cover-slip preparation shows many polymorphonuclear leucocytes and numerous diplococci that stain by Gram's method. No other bacteria seen. Tympanic membrane and ossicles intact.

Anatomical Diagnosis. Chronic leptomeningitis. Chronic internal hydrocephalus, secondary to the occlusion of the fourth ventricle. Acute suppuration of the right middle ear. Atrophy of the bones of the skull.

CASE IV.—J. E., aged fifty-eight years, married, born in Germany, and worked in a slaughter-house. On May 13, 1897, entered the service of Dr. Bowditch in the Boston City Hospital. Excessive beer drinker; "rheumatism" for nearly a year, and "sleeping spells." Two days before entrance drowsiness and stupor appeared, with pain in both ears, but without headache. On the day of admission, nausea. Examination: Well developed and nourished; semi-conscious, at times delirious; slight ptosis of the left eye; left pupil smaller than the right; neither react. The tongue protruded evenly; considerable tenderness exists below the mastoids. Pulse regular, of good strength and volume; arteries thickened and tortuous. Chest and abdomen negative; knee-jerk on the right, but left diminished. Cremasteric reflexes sluggish; urine normal; temperature 99.4° to 96.2° F.; pulse 65 to 90, and respirations 17 to 28. May 16th, the patient, at times delirious, but generally stupid, became unconscious and died May 19th.

Autopsy by Dr. Mallory. Brain: Dura about normal in thickness; pia much thickened over the whole brain, white and opaque; thickest and whitest along the large bloodvessels. It corresponds exactly with an acute inflammatory exudation in the meninges, except that it is white and opaque instead of yellowish. In its thickest portions the pia was exceedingly tough and could with difficulty be torn.

It stripped off from the brain-substance rather easily, and did not tear it much. Over the lateral portions of the brain the exudation was less marked, confined almost wholly to the neighborhood of the larger vessels. In places at the apex it was thick enough to obscure the brain tissue and the vessels beneath. In its meshes was a considerable amount of serum. At the base of the brain was an abundant whitish exudation, most marked over the medullary and upper portions of the cervical cord. The brain was removed with difficulty on account of its being necessary to cut through the adhesions between this portion of the cord and the foramen magnum. The optic nerves were swollen and soft and the commissure was shoved inward. Just back of it, surrounding the pedicle of the pituitary body, was a firm, grayish, translucent mass. The cranial nerves, other than the optics, seemed to be normal. There was little exudation over the pons or along the fissure of Sylvius. On opening the brain the lateral ventricles were found to be considerably dilated, containing each 30 to 40 c.c. of fluid. The ependyma was slightly granular. The bloodvessels were moderately injected. In the third ventricle was a small mass of whitish fibrin, attached at one end of the wall. In the fourth ventricle was a mass measuring 1.5 cm. in diameter and 3 mm. in thickness, unattached to the wall; its edges were rounded and extremely like a small piece of decolorized fibrin. The sides of the corpus striatum adjoining the third ventricle were swollen, firm, and transparent, and resembled closely the tissue described as lying just back of the optic commissure; on each side it was about 1.5 cm. in width. Outside of this on both sides, but particularly on the left, the central portion of the corpus striatum was very oedematous, soft, and transparent.

Anatomical Diagnosis. Organization of acute cerebro-spinal meningitis, with occlusion of the foramen of Majendie and the production of internal hydrocephalus.

CASE V.—Duration sixty days. A. A. D., aged sixteen years, single, a brass and iron filer, entered the service of Dr. Vincent Y. Bowditch at the Boston City Hospital on May 2, 1898. As a child he had measles, and at four years scarlet fever, followed by "kidney trouble." Habits good. About the last of March he had a fight, was hit on the mouth and knocked backward against a wall, striking his head and neck. Present illness began two weeks before entrance, with languor and insomnia. While he was having these symptoms a man, with whom he lived up to February 2d, came to the hospital and died with cerebro-spinal meningitis. Three days before entrance he was suddenly seized with violent frontal headache, with dimness of vision. Worked until 6 P.M., when he vomited several times. The next day headache was more severe, and he had several chills and vomited. Dimness of vision increased; he staggered in walking, with a tendency to fall to the right. Toward night he became delirious. On the day before entrance delirium alternated with rational spells. Fell out of bed. A macular eruption appeared on the face, which disappeared within twenty-four hours. Pulse irregular and very slow. On the morning of entrance he had a convulsion; rigid, with hands clenched; cyanotic and stertorous respiration. Retraction of the neck was now for the first time noticed. Bowels constipated, but at no time involuntary defecation or urination. Examination: Well developed and nourished; stupid; flushed face; pain on pressure on the back of the neck, and slight

pain on movement of the retracted head. Right pupil larger than the left; both react. Conjunctivæ congested, and there is a questionable external strabismus. The tongue is covered with a moist, brownish coat; sordes about the teeth. Heart is normal except for prolongation of the first sound at the apex; pulse normal. Lungs and abdomen negative except for enlarged spleen. Knee-jerks lively. Small petechiæ over the skin. Leucocytes, 20,600. Urine normal. May 4th, slight ptosis of the left eye. May 5th, leucocytes, 9000. May 7th, steady improvement; no pain. May 8th, Dr. Lancaster reports a slight swelling of the optic nerve, with the veins considerably distended and tortuous; a few minute hemorrhages in retina near the disk; beginning optic neuritis. May 16th, patient doing well; no new symptoms except diplopia for distant objects. On May 20th he was discharged "well." The temperature did not rise above 99.4° F., and the pulse was for the most part of the time about 70, but was in the 50s on three occasions and just before discharge. June 17th, re-entry in the service of Dr. Henry Jackson. The patient had been comparatively well since leaving the hospital save for general bodily weakness, and on this account has attempted no physical exertion. Yesterday he felt so well that he rode a bicycle, but came home tired and with intense frontal headache. Went to bed and slept. About five o'clock this morning he got out of bed, walked ten feet, and had a convulsion, falling unconscious to the floor. At nine o'clock he had a second convulsion, at one o'clock a third, and at four o'clock a fourth, lasting about eight minutes, with frothing at the mouth. At 4.30 P.M., during another convulsion, he died. Examination made shortly before death showed him to be semi-conscious, delirious, opposed handling. Little, if any, stiffness of the neck; motions of the head resisted. Marked left external strabismus, with moderately dilated pupils, which react sluggishly to light. Pulse regular, full strength and volume. Heart, lungs, liver, and spleen negative. Knee-jerks lively. Leucocytes, 26,160. Temperature, 99° F.; pulse, 108; respiration, 29.

Autopsy. Brain weighed before opening 1650 grammes; after opening, 1530 grammes; 120 grammes of fluid. Dura tense. On stripping it back the surface of the brain was moderately injected; very dry. No thickening of the pia can be made out anywhere, unless possibly a little around the optic commissure and posterior to it. The floor of the third ventricle projects outward 3 mm. On opening the brain, the lateral ventricles are found to be distended and filled with a perfectly clear, watery fluid. No evidence of any inflammatory exudation can be found in the posterior cornua. The ependyma shows very slight granulation. The third ventricle contains a spherical, soft, yellowish cyst, measuring 13 mm. in diameter. It is adherent at several points to the choroid plexus of the third ventricle. Its wall is yellowish and to some extent translucent. On section the tumor is found to be encysted with a thin, delicate wall; the contents are grayish, rather opaque, and tenacious, sticking more or less together. Microscopical examination of this material shows it to consist partly of leucocytes, partly of large cells filled with fat-drops. The tumor mass obstructs the iter a tertio ad quartum. The wall of the third ventricle is thickened and granular. At the tip of the temporal lobe on the right side is a small, yellowish area, 2 mm. in diameter. Cyst due to puriform softening of the mass of fibrin in the third ventricle following cerebro-spinal menin-

gitis. Obstruction of the iter a tertio ad quartum. Internal hydrocephalus.

CASE VI. is not as typical as the others, but will serve as the connecting link between the acute cases and the chronic ones, in which the hydrocephalus fully developed. Duration forty days. R. P., an errand girl, aged seventeen years, born in Germany, entered the Boston City Hospital on October 21, 1898, in the service of Dr. George B. Shattuck. Family history negative. Usual children's diseases and diphtheria. Present illness began three weeks ago, with pain in the right arm, extending to the shoulder and down the back to the lumbar region. Intense pain in the frontal and apical region of the head, also pain and tenderness in the back of the neck. Considerable photophobia. For the first three days of sickness there were numbness and "pins and needles" in the legs and inability to move them. Chills nearly every night. In the chest is a feeling as of suppressed hiccoughs, with a slight hacking cough. Tonsils somewhat enlarged and painful when yawning. Micturition was accompanied by a burning, cutting sensation. Yesterday a temporary aphasic attack, lasting for ten minutes, and to-day another for five minutes. Vomited frequently at first, later irregularly. Examination: Well developed and nourished. Temperature, 100° F.; pulse, 90; respirations, 10. Pupils equal, dilated, and react. Neck painful to pressure. Heart and lungs normal. Spleen slightly enlarged. Reflexes normal. Leucocytes, 19,000. Widal reaction negative. On the day after entrance the patient had a severe chill. Mentality unimpaired, but in the afternoon a temporary paralysis of the right side of the face. October 24th, another chill, and headache so intense that she shrieked. October 26th, eyes and ears drawn to the left. Some difficulty in following the movement of the finger beyond the median line to the right. Constant twitching. Increased left patellar reflex and an ankle-clonus persisting for many minutes. A loud systolic murmur at the apex and over the whole cardiac area, which later disappeared. October 27th, clonus absent. October 31st, semi-conscious. November 4th, unconscious; temperature moderate; no more chills. November 8th, for the past two days temperature, pulse, and respiration all elevated; semi-retraction of the head; labored breathing. November 9th, died.

Autopsy by Dr. Mallory and Dr. Defendorf. Brain weighed 1295 grammes; dura rather tense. On removing it convolutions are a little flattened; vessels of the pia injected a little more than normal over the vertex of the brain; no thickening of the pia arachnoid; the olfactory bulbs are adherent to the skull. On removing the brain quite a little fluid escapes from around the base. On the under surface of the brain, over the circle of Willis and slightly involving the optic commissure, there is a whitish, rather translucent, tough deposit, varying from 2 to 3 mm. in thickness. A platinum needle could be drawn through it with difficulty. A little of a similar material is present over the vermiform process of the cerebellum and extending out toward the fissure of Sylvius. Otherwise than for this material the surface of the brain presents nothing abnormal. On opening the brain the lateral ventricles are somewhat distended with fluid, at least 20 c.c. each. The ependyma is everywhere finely granular. Over the corpus striatum the granules are decidedly prominent and larger than one ordinarily sees in this condition. In the right ventricle and in the inner posterior

corner of the corpus striatum, just where it joins the optic thalamus, is a small, yellowish, opaque elevation, 4 mm. in diameter and projecting 2 mm. above the ependymal surface. In the posterior cornua of both lateral ventricles is a soft mass of yellowish material, forming a little over 1 c.c. in each horn. Microscopically this contains more or less broken-down fibrin and a few pus-cells. The third ventricle is a little dilated and its ependymal surface decidedly granular. A similar condition is present in the fourth ventricle. In the lateral pockets is a little yellowish material similar to that in the horns of the lateral ventricle. The substance of the brain presents nothing abnormal microscopically.

Anatomical Diagnosis. Organizing meningitis. Granular ependymitis. Moderate degree of internal hydrocephalus.

CASE VII.—Duration eighty-two days. Maggie D., aged twenty-four years, entered the service of Dr. W. W. Gannett at the Massachusetts General Hospital on October 2, 1897. Family history good. Two weeks before entrance she buried a child with cerebro-spinal meningitis. Four days before entrance she vomited without cause, and on

CHART III.

the following day was attacked with headache, backache, and vomiting, which again was of sudden onset, and, in conjunction with diarrhoea, caused great weakness. Examination: Well developed and nourished; good color, many herpetic vesicles about the lips. Pupils reacted, but were unequal, which the patient said was always the case. Neck rigid and tender. Chest and abdomen normal. Knee-jerks and plantar reflexes present. Leucocytes, 23,600. Diplococcus intracellularis Weichselbaum was grown from the nasal discharge. Vomiting and headache continued after entrance. The pulse was irregular, and fresh crops of herpes appeared. Between the seventh and twelfth days she improved, but occasionally had diplopia. Many hyperæmic papules appeared on the thighs and legs, which later changed to pustules. During the next week she was better and worse by turns. At times the heart was weak and the respiration suggestive of the Cheyne-Stokes type. Leucocytes on the nineteenth day, 10,600. On the twenty-fifth day the eyes were examined by Dr. Cheney: Slight congestion of the retinal veins. Persistent vomiting, with resulting emaciation. Leucocytes on the forty-eighth day, 9600; on the fifty-fourth day, 8200; on the sixtieth day, 7000; and on the seventieth day, 16,200. The left pupil lost its reaction

CHART IV.

to light on the eighty-first day, which was the day of her death. For some days previous the knee-jerks had not been obtained. Vomiting, however, ceased during the last week of life. Cheyne-Stokes respiration at times manifest.

Autopsy. Meninges of convexity dry, not specially injected, and showing no exudate. Convolutions somewhat flattened. At the base over the pons and a portion of the medulla the meninges were infiltrated, with a yellowish, semi-translucent, somewhat jelly-like material. The region of the chiasma was free from exudate. On removing the brain a stream of clear, watery, colorless fluid squirted from an opening in the neighborhood of the optic chiasma. Lateral ventricles and fourth ventricle markedly dilated, and contain a rather cloudy fluid. In the lateral ventricles some large, fibrinous floculi were present. Dissection of the brain shows nothing remarkable except that the tissue of the corpus callosum and fornix posteriorly is perhaps softened. Lateral sinuses free. Cord: No accumulation of fluid in the subdural space. In the cauda equina and in the meshes of the pia of the thoracic and lumbar portions are accumulations of opaque, yellow exudate arranged in patches. Exudation is not extensive. In the thoracic portion the cord seems softer than normal; this may be due to injury in removal.

Anatomical Diagnosis. Subacute cerebro-spinal meningitis; internal hydrocephalus.

CASE VIII.—Duration one hundred and thirty-one days. (Chart IV.) J. C. entered the service of Dr. R. H. Fitz at the Massachusetts General Hospital on February 11, 1898. Parents and one sister died of phthisis, and another sister has the disease. Except for bronchitis at three years of age he has been well. February 8th he was exposed to cold and wet, and felt chilly, had pains in his arms during the night, and was delirious.

February 9th, headache and vomiting commenced and persisted. Examination: Fairly developed and nourished man, in much pain. Pupils small; reaction sluggish. Neck and back stiff. At the apex and base of the heart a faint systolic murmur. Knee-jerks present. Leucocytes, 36,000. Urine slight, trace of albumin, rarely a hyaline cast; no diazo reaction. During the next few days delirious and in pain. Leucocytes, 12,700 on the sixth day, but 20,000 on the eighth. On the following day he developed a pneumonia of the right lower lobe, with a leucocytosis of 34,000. Four days later, still very ill, and leucocytes 40,300. On the seventeenth day a patch of pneumonia appeared in the left back, and the white corpuscles were 50,800. For the next seventeen days he continued to improve, but the white count fell only to 26,000. By the fifty-ninth day a living skeleton; answers "yes" and "no" and "fine;" lies with his eyes closed and arms folded. Micturition involuntary and vomiting frequent. On the twenty-fifth day he had a chill, and leucocytes 45,700. No plasmodia. A bacillus similar to the tubercle bacillus was found in the sputum, but pronounced by Drs. Ernst and Wright not to be the tubercle bacillus. From about the sixtieth day on the temperature was usually normal or subnormal. At times there appeared to be some slight improvement in his condition, but on the one hundred and sixth day his weight was 63 pounds instead of 130 pounds as at entrance. Leucocytes still increased, being 26,000. On the one hundred and twenty-second day, failing slowly and more emaciated. Skin dark; bloodvessels distended; bed-sores on the back, thighs, legs, knees, ankles, elbows, and shoulders, and there seemed to be only just enough tissue left to hold the bloodvessels together. Cheyne-Stokes respiration ushered in the end on the one hundred and thirty-first day.

Autopsy. Chronic leptomeningitis of the base of the brain and of the spinal cord, with hydrops ventriculorum and softening of the right lenticular nucleus. Head: Dura normal; pia of convexity normal; convolutions flattened. At the base an accumulation of thin, cloudy fluid. The pia at the base shows fibrous shreds and some thickening. Frontal lobes more adherent than normal. Lateral ventricles considerably dilated. A large part of the right lenticular nucleus mushy, soft, and brown in color. Vessels and cerebral tissue otherwise not remarkable. Middle ears normal. Spinal cord: Dura everywhere rather firmly adherent to the pia-arachnoid by translucent tissue. Cervical cord fluctuating to the touch. On section of the dorsal and lumbar cord the nerve tissue seems to show extensive softening, is soft and mushy. No fluid accumulation in the dural sac. The cervical region seems somewhat enlarged and fluctuant.

A Résumé of the Literature on Internal Hydrocephalus following Cerebro-spinal Meningitis.

Internal hydrocephalus has been known to be a result of epidemic cerebro-spinal meningitis since 1805, the year in which the disease is usually considered first to have appeared.

In the same year¹ (1805) a case occurred at Strasburg, terminating fatally after two relapses, the last one being accompanied by cerebral

¹ Quoted by Webber. Boston Medical and Surgical Journal, vol. lxxv., p. 85.

hydrocephalus. At the post-mortem exam the tunics of the brain and membranes were enlarged with fluid: serum fluid was found between the meninges above the cerebellum. The brain was soft, the ventricles were dilated and contained about four ounces of serum with a deposit of purulent plastic matter lining their cavity. *Journal de Med. Clin. et Pharm.* vol. vii. p. 1.

Fournier, in 1843, gave a very good description of this complication. He says the inflammation usually runs a fatal course, a recovery being seldom complete: sometimes the acute symptoms cease and the case becomes chronic. Meanwhile the secretion of serum continues and forms a chronic hydrocephalus. The ependyma at times remains forever generally or partially thickened.

Ziemssen and Hesse published a long article upon "Clinical Observations in Epidemic Cerebro-spinal Meningitis," in which they record four cases of long duration which showed at the autopsy internal hydrocephalus. No decision was reached as to whether the process was inflammatory or due to a passive congestion from pressure on the veins of the choroid plexus.

To this excellent account Ziemssen,¹ in 1874, added a more extensive description, which to-day embodies more than any other article on the subject. He says that lasting alterations in the brain, the spinal cord, and their membranes are not by any means seldom. Among these chronic hydrocephalus appears to form far and away the most frequent after disease. He explains this change as follows: The slightly altered, perhaps thicker, exudation is absorbed slowly or quickly in the second week, through fatty degeneration of the cells and fibrin, or, in consequence of absorption not occurring, shrivels up into a caseous mass. While the connective tissue of the soft membranes proliferates the hyperæmia of the brain-substance subsides and the purulent effusion in the ventricles increases. In the twenty-seventh or twenty-eighth week the soft membranes show a pulpy hyperplasia or already cicatricial thickening; the caseous remains of the exudate contract still further; the effusions in the ventricles become more moderate in amount, but quite clear, while the cellular elements in the dependent parts of the ventricles are thickened to small, caseous plates. The earlier hyperæmia of the brain is completely gone; the brain is anæmic, even œdematous; the ependyma of the ventricle is thickened and clearly granulated, and the choroid plexuses bloodless. The diminution of the brain substance depends on the degree of the hydrocephalus, but can be very considerable. It almost appears as if the increase of the ventricular effusion was conditioned in the first instance by the contractions and thicken-

¹ Path. Anat., 1868, p. 597.

² Deutsches Archiv., 1865, vol. i.

³ Handbuch d. acuten Infect. krankheit., Zweiter Theil, 1874, p. 683.

ings of the soft membranes. At least the usual stage of apparently progressive convalescence between the acute attack of meningitis and the appearance of the hydrocephalic signs speaks for this view.

The symptoms of the secondary hydrocephalus consist of paroxysms of severe headache, and also of pains in the neck and extremities, with vomiting, unconsciousness, convulsions, involuntary evacuations of feces and urine.

These attacks recur either in a pretty regular type or make pauses which not rarely last for weeks, and during which the activity of the mind and senses may be unimpaired, the appetite excellent, the sleep restful, and the patient in good spirits and gaining strength. If these interims last for a considerable time we easily fall into the error of supposing that the disease has taken a favorable turn, until a new attack dispels the illusion. Generally, however, the condition during the interval is not so favorable that such a prognostic error is possible; there persists the general hyperæsthesia, increased reflexes, furthermore slight contractures or pareses of the extremities, psychical disturbances, and other symptoms.

Of great practical importance is the question whether and to what degree these hydrocephalic effusions are capable of retrogressive changes; in other words, is cure of a secondary hydrocephalus ever possible? Generally it is not; "yet I have seen some cases in which a complete, and others in which an incomplete, recovery took place."¹

In the interval between Ziemssen's two publications Collins² gave an excellent report upon "Epidemic Cerebro-spinal Meningitis." He says a return of this symptom (pain in the head) in company with vomiting and convulsions but too frequently points to the issue of the disease in hydrocephalus. He records the case of a boy, aged ten years, who died on the sixty-sixth day of his illness, with, he thinks, the cause of death due to an occlusion of the cerebro-spinal opening. This is the first direct mention of this as the cause of the hydrocephalus in such a case that I have been able to find.

In 1876, Neville Hart³ recorded four or five typical cases of hydrocephalus following meningitis, and in describing the symptoms it is interesting to note that dilatation of the pupils was constant in the late stages. The respiration was irregular, there was great emaciation, bed-sores, paralysis of the bladder and rectum, and in a few cases of the pharynx.

Heubner⁴ describes this type of cerebro-spinal meningitis. He says that hydrocephalus is to be recognized by paroxysms of pain, vomiting,

¹ Archiv f. klin. Med., Band I., p. 389.

² Dublin Quarterly Journal, 1868, vol. xlv., p. 170.

³ St. Bartholomew's Hospital Reports.

⁴ Eulenberg's Encyclopædia, third edition, pp. 480, 485, 487.

coma, and convulsions. The weakness of memory, intelligence, and speech may be due to the same cause.

Eichhorst¹ says he has repeatedly seen hydrocephalus develop, and in two cases far advanced in convalescence there suddenly appeared headache and apathy, which resulted in a few hours in death, for which the only cause was a marked internal hydrocephalus.

Von Leyden² calls attention to epileptic convulsions as characteristic of meningitis of the convexity, but to coma and cerebral paralysis as significant of large exudations in the ventricles. Later,³ he says the danger of the disease lies more in the danger to the brain-substance through the exudate than through the severity of the infection.

This by no means exhausts the literature, but most of the articles written on the subject are quoted under one or another of the above references or are referred to on page 128 of the *Report of the State Board of Health of Massachusetts*, 1898, which was written by Councilman, Mallory, and Wright.

PATHOLOGY. A comparison of the reports in our eight cases of cerebro-spinal meningitis shows a marked uniformity. In all save one the hydrocephalic fluid was clear and colorless, and was sterile in two instances in which it was examined; in a third, diplococci were found, though not the specific diplococci of the disease under discussion. (The presence of bacteria in this case (VII.) may account for the peculiarity of the high temperature which existed in the latter weeks of the illness and rendered the case unique in this respect—*i. e.*, a secondary infection may have taken place. This is by no means certain, however, as the bacteria were few in number.)

That the hydrocephalic fluid was sterile we should expect, for it is an acknowledged fact that the bacteria in these cases disappear in the early part of the disease. Akin to this is the absence of collections of pus, save in the cases of shortest duration (VI. and VII.), in which leucocytes were found in the cornua of both lateral ventricles.

The pia is reported thickened in all cases in the region of the roof of the fourth ventricle, and in most of the cases elsewhere as well, particularly at the base of the brain. The thickening was of marked degree, in one case resisting the thrust of a platinum needle, in another necessitating a division of the adhesions. This thickening is due to organization—that is, to the formation of granulation tissue, which starts from the pia and grows into the fibrinous exudation, gradually dissolving and removing it. It covers enough surface not only to bar the foramen of Majendie and the two lateral openings of Mierzejewski, but to render impervious the whole roof of the ventricle.

¹ Hand. der spec. Path. u. Therapie, 1897, p. 527.

² Zeitschrift für klin. Med., 1887.

³ Nothnagel Series, vol. x., p. 291.

There does not appear to have been any thickening of note in the above cases about the bloodvessels except in Cases III. and IV., nor were the choroid plexuses injured.

The changes in the brain resulting from the increased pressure were not different from those of other cases of hydrocephalus. The flattening of the convolutions varied with the amount of fluid. The bloodvessels of the pia were, as a rule, injected.

There is less uniformity in the condition of the ependyma. In the first case it was swollen and velvety, in the second somewhat thickened, smooth in the third, and very slightly granular in the fourth, fifth, and sixth. Nothing abnormal was observed in the seventh and eighth.

In the light of the records of the preceding cases and the observations collected from other sources, a very definite description of this sequel of meningitis can be given.

Unless the disease is rapidly fatal, toward the end of the second week the intense hyperæmia of the soft membranes subsides, and the fibrinopurulent exudate begins to undergo absorption in the same manner as in any other portion of the body. At the same time the large or small effusion in the ventricles, which is turbid with flakes of pus in the extremities of the cornua, changes its character. This purulent material is either absorbed, owing to the abundant vascular supply furnished by the choroid plexuses, or shrinks into caseous masses which are deposited on the walls of the ventricle. In either event, by the end of the third week, if not before, the fluid in the ventricles and subarachnoid spaces is clear, and, as experience has recently shown, is sterile. This latter fact is of especial importance, because it helps to exclude the idea of a chronic inflammation of the ependyma as a cause of this hydrocephalus.

During the next few weeks the organization of the exudate occurs, and in our opinion, according to the extent of this process of repair, which in turn is necessarily dependent on the location and amount of the exudate at the commencement of the disease, rests the final outcome of the case. If the nerve-roots have been embedded in the exudate they are liable to suffer from the cicatricial thickening about them. If the inflammation has been extensive and the meninges of the base of the brain "plastered" in the region of the roof of the fourth ventricle, the foramen of Majendie and the neighboring foramina of Mierzejewski may be obliterated and the velum interpositum thus rendered impervious. We have taken for granted that there is such a foramen and such neighboring foramina, as this appears to be the prevailing opinion; but should one not accept this supposition it would not alter our argument, for the whole velum is often covered with the exudate, and the whole might be easily rendered impervious. A hydrocephalus would then be the natural result.

In 1863, Hilton, in his *Lectures on Rest and Pain*, emphasized this factor in the etiology of hydrocephalus. He mentions and delineates the specimen from a case which he autopsied in 1844. Collins followed Hilton's lead, and in a case of cerebro-spinal meningitis of his own attributes the resulting hydrocephalus to the closure of the foramen.

But by no means is this the only method for the production of an intraventricular effusion non-inflammatory in character. In many cases the lateral and third ventricles are dilated, but the fourth not. In Case V. of our series this occurred, and the cause was manifest—there was an obstruction of the iter a tertio ad quartum. This is not, however, a unique occurrence, and it is only to be wondered at that this does not occur more frequently, for it is so easy for a collection of fibrin to become organized at this spot. Similarly the foramina of Monro may be plugged, one or both, and such would seem to be the case in those ordinary forms of chronic hydrocephalus in children in which puncture of one ventricle serves to drain only that side of the brain. Naturally there is no reason why the veins of the choroid plexuses should not be compressed by the cicatricial contractions; but it is not clear how this occurrence alone would explain the hydrocephalus, providing the paths for the circulation of the cerebro-spinal fluid were intact. It must be a complete obstruction of the veins, indeed, that would suffice to produce such an increase in the amount of cerebro-spinal fluid as to start in operation that vicious circle hydrocephalus leading to compression of the brain and its vessels, thereby preventing the removal of the excess of fluid and at the same time favoring an increase in the hydrocephalus.

SYMPTOMATOLOGY AND DIAGNOSIS. It is impossible to decide definitely when the hydrocephalus begins in these cases, because the symptoms of meningitis and hydrocephalus are in the first instance so similar, and in the second place both conditions may exist together from the start. In three cases (I., III., and V.) an abatement of symptoms or an interim of apparent convalescence followed the first attack, while in four patients (II., VI., VII., and VIII.) the active stage of the meningitis merged into a condition which was evidently directly attributable to the hydrocephalus. Case V., for example, so far recovered from his initial attack that he was able to take a bicycle ride, though with disastrous sequences. Case I., with some help, made his way up and down stairs. Case VII., however, was of eighty-one days' duration, but presented no symptoms of hydrocephalus in the last month other than the ravages upon the system of a long illness, which were not present in the first four weeks of the disease.

These cases further show that no relation exists between the development of the hydrocephalus and the severity of the original attack. Cases I., III., and probably IV., were of mild character, while in the

others the disease was severe. From this we may infer that it is not so much the extent and intensity of the initial inflammation as it is the location of the same.

ANALYSIS OF SYMPTOMS. Apathy or mental lassitude on the part of the patients is the predominant factor in the symptomatology. The histories lead us to believe that this was present in each case which was under observation. Beginning with simply apparent drowsiness and indifference, it gradually increases until the patient appears asleep the greater part of the time. In reality he is not, for he is easily aroused and responds to a question, but only to drop off again into his former condition. One can trace the gradual increase of this lethargy in the steady diminution of voluntary efforts and remarks on the patient's part. He is profoundly passive. This state may pass into one of unconsciousness, as in Case II., and the patient remain in this condition until death. Usually this is temporary, and the patient finally dies somnolent rather than unconscious.

Vomiting took place in all but one of the eight cases. Its irregular occurrence, the absence of any relation to diet or treatment, and the lack of other gastro-intestinal symptoms stamped it as of nervous origin.

Headache was severe in one-half of the cases, but in three of the others it was distinctly of mild type, and in one patient was wholly absent. The somnolence of the patients may have masked its character, but it is certain that it was far less severe than the headache of onset.

The pupils were dilated or reacted sluggishly or not at all in seven of the patients. In the final case no note is made of their condition.

Muscular weakness and emaciation were the rule, but not out of great proportion to the length of the disease and the small diet.

The temperature curves are extremely suggestive, because they were of normal or subnormal character for much of the illness, especially for the few weeks before death. In Case II. there was a rise for about forty-eight hours before the end, and in Case VII. the curve is so similar to that of typhoid fever that we are glad to know its absence was confirmed by the autopsy. The relation of temperature to pulse is most striking. In Cases I., II., VI., and VII. the pulse repeatedly *rises* as the temperature falls, and *vice versa*. This reverse of the rule is not absolute, and holds chiefly for the early part of the disease. Toward the end the pulse falls, and then appear those great irregularities in rate from hour to hour which have always impressed the physician. These later irregularities, however, as well as the Cheyne-Stokes phenomenon, which occurred four times, are terminal manifestations.

Quite in accord with the pathological findings is the most striking clinical feature of these cases, namely, their long course. The duration of the various cases was successively eighty-nine, fifty-two, ninety

to one hundred (?), sixty, forty, eighty-two, and one hundred and thirty-one days.

Mental apathy, vomiting, headache, dilated or sluggish pupils, with a normal or subnormal temperature when they occur a month or more after the onset of cerebro-spinal meningitis, point to hydrocephalus. Convulsions, paralyses, including aphasia, optic neuritis, dizziness, involuntary passage of excreta, and bed-sores may be concomitants, but they are less common and not as distinctive. With the absence of fever in these cases it is surprising that in Case III., five days before death, the leucocytosis was 19,000; in Case V., on the day of death, 26,000; in Case VIII., with an almost unbroken normal or subnormal temperature for weeks before and after, that it should be on the ninety-fifth day of the disease 26,000.

PROGNOSIS. Von Ziemssen¹ says he has seen some cases in which a complete, and others in which an incomplete, recovery took place. Hart² mentions two cases of recovery of the chronic form. Of course, in the nature of the case, positive data regarding recovery from the hydrocephalus are and must be uncertain, because of the difficulty of the diagnosis. In looking over the 111 cases recorded in the *Report of the State Board of Health of Massachusetts* I find that twenty-two cases were of forty or more days' duration. The mortality for the whole number of cases was 68 per cent., but of the twenty-two mentioned was 23 per cent. Of the seventeen cases which eventually recovered eleven had some definite signs of hydrocephalus, four evidently did not have hydrocephalus, while a mastoid abscess delayed the recovery of one case, and the status of the remaining patient was not determined. On the other hand, of the five who died an autopsy was made in Case XL., but revealed no hydrocephalus, and the records of Cases XXIV., XXXIX., XLV., and LXXXI. are not of enough detail to warrant a diagnosis. Whether the eleven patients with symptoms of hydrocephalus, who were discharged from the hospital later, remained well is not known. We do know that Case V. of our series was discharged on the twenty-third day from the onset of his illness, yet died of hydrocephalus on the sixtieth day.

TREATMENT. Several of the probable cases of hydrocephalus just mentioned which recovered were tapped one or more times, but nothing indicates that this was of especial benefit. No large amount is reported removed and no marked amelioration of symptoms noted. The treatment of the fatal cases was purely supportive and symptomatic, and this holds good for the others. In the literature recently there have been many reports on the efficacy of lumbar puncture in hydrocephalus

¹ Cyclopædia of the Practice of Medicine, vol. II., p. 728.

² Report of the State Board of Health of Massachusetts, p. 129.

after meningitis, but a study of these has failed to convince me of its usefulness. And how improvement can take place by this or any other means is very hard to see. The sudden death within twenty-four hours in Case V., following unusual exertion after a long period of convalescence, shows how careful one must be in the care even at a time when a cure appears established.

A CRITICAL SUMMARY OF THE LITERATURE

ON THE

DIAGNOSTIC AND THERAPEUTIC VALUE OF LUMBAR PUNCTURE.

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SINCE H. Quincke's¹ epoch-making contribution in 1891, which showed appreciation of a hitherto unused anatomical fact and opened up a wide realm for investigation, there has accumulated a vast amount of literature dealing with removal of cerebro-spinal fluid through a needle introduced into the subarachnoid space between the transverse processes of the lumbar vertebræ, or, as it is briefly expressed, lumbar puncture. So extensive is the literature that only those articles will be here referred to which bring out the different points of the subject, the conclusions being based on a general review of all accessible articles.

R. Neurath² has given a very exhaustive review of the subject up to 1898; and while this article will, to a certain extent, be supplementary to Neurath's, it will, of necessity, touch on many of the articles which appeared prior to two years ago.

Quincke first used the operation for the relief of excessive intracranial pressure in cases of chronic hydrocephalus, to supplant the more formal operation of tapping the ventricles, which procedure necessarily often caused trauma to a limited region of brain-substance. From this as a start, the field of lumbar puncture has widened, so that it may now be said to have therapeutic and diagnostic indications. The therapeutic indications are: (a) to relieve excessive pressure by the cerebro-spinal fluid on the brain and cord; (b) to remove active deleterious bodies which may be present in the cerebro-spinal fluid.

The causes of increased tension in the cerebro-spinal fluid are: all

¹ Verhandlung. des Congresses f. Innere Medicin, 1891, x.

² Centralblatt f. die Grenzgebieten der Medizin und Chirurgie, vol. 1., 1897-98.

inflammations of the internal or external membranes, including hydrocephalus; tumor; chlorosis; traumatism; toxic states, such as those produced by lead, uræmia, or the infectious fevers. In estimating with the manometer the pressure of the cerebro-spinal fluid as it flowed through the needle, observers were at the start met with the difficulty that the normal degree of pressure in man was unknown, and when measurements were then made of it, wide variations were found to occur in health under varying conditions. Then conflicting reports were made of the pressure existing in diseased conditions, some observers reporting the finding of excessive pressure, others, in the same disease, a normal degree, while others failed to obtain fluid, which is sometimes an indication of the absence of any pressure. Order, to a large extent, has been brought out of this chaos by the valuable report of M. Pfaundler.¹ He has shown that the mistake originally was in looking upon the pressure as a unit in itself, whereas it is really made up of three elements, hydrostatic, vascular and elastic. The hydrostatic element is that pressure which the column of cerebro-spinal liquid exerts when the patient is in the sitting posture and disappears when he lies down. The element of elasticity is that furnished by the walls of the subarachnoid space and of the ventricles, which, when the amount of fluid is increased, tend by reason of their resiliency to compress the fluid; because of the bony case surrounding the brain and cord, distention of the cavities is limited, and the elastic element is therefore not great; it can be measured only during a puncture made post-mortem with the body recumbent, and usually measures about 2 mm. of mercury, although distention may increase it to 10 mm. The most important element in the pressure is the vascular, or that carried over from the heart through the bloodvessels, and it is to this that the symptoms of pressure are mainly due.

Pfaundler has estimated the normal subarachnoid pressure in the sitting posture to be from 20 to 25 mm. of mercury, about half of which is hydrostatic and disappears when the patient lies down. Estimation of the pressure by the manometer is, however, feasible only in hospital work, and it is not of so much concern to the general practitioner as the other points of the operation.

The technique is simple, and remains practically the same as suggested by Quincke, consisting of surgical cleanliness, introduction of the needle between the third and fourth lumbar vertebræ, 5 to 10 mm. to one side of the middle line, the direction of the needle being slightly toward the middle line, and in older children and in adults, slightly upward; the necessary penetration varies with the age and state of nutrition of the patient, and can be determined by the sense of touch which will tell when the cavity is reached; usually, 2 cm. in children and 4 to 6 cm. in

¹ Jahrbuch f. Kinderheilkunde, 1889, Bd. xlix.

adults are the required depths. Variations occasionally necessary from this technique are more fully described by L. A. Conner.¹

THE DIAGNOSTIC VALUE. It is necessary at the start, for purposes of comparison, to know the characteristics of normal cerebro-spinal fluid, and thanks to the researches of A. H. Wentworth,² E. Stadelmann,³ H. Lenhartz,⁴ C. Comba⁵ and others it has been found to be a faintly alkaline, sterile, perfectly clear and colorless fluid, with a specific gravity ranging from 1001 to 1009, containing albumin and sugar and free from cells and other morphologic elements.

Comba has studied especially the diagnostic value of the chemical examination for sugar, with these conclusions:

1. In cerebro-spinal fluid drawn during life from children not attacked with meningitis there exists constantly a glucose-like reducing substance. The average quantity is 4 to 5 centigrammes per 100. In grave pneumonic processes it is increased a little.

2. In tuberculous meningitis the glucose is found in small amount at the start, and is absent toward the end.

3. In the meningitis due to the meningococcus of Weichselbaum and to the diplococcus of Fraenkel the absence of glucose in the exudate is constant.

4. The diminution and disappearance of glucose in the cerebro-spinal fluid are probably due more to the glycolytic action of the nucleoproteids of the leucocytes than to that of the bacteria contained in the exudate.

5. The proportion of glucose is less than that of the blood (5 to 15 cgm. per 100, according to Bunge), which tends to prove that it is a product of secretion rather than of transudation.

The amount of albumin in normal fluid is usually given as 0.2 part in 1000, the highest amount reported being 1 in 1000. Most observers agree with Lenhartz's statement that over 0.25 per 1000 speaks for inflammation, there being to this a few exceptions, as amounts of 2 to 4 per 1000 have been observed in tumor and apoplexy. While the usual amount in meningitis is about 2 to 3 per 1000, in purulent meningitis, tumors, or hemorrhage it may be increased to 7, 8, or even 9 per 1000.

With reference to the clearness of the fluid, there is a discrepancy in the different statements. Thus, Lenhartz says the appearance is of small value and the fluid may be in meningitis either purulent, seropurulent, slightly cloudy, or perfectly clear. Felsenthal⁶ says practically the same, in purulent meningitis the fluid always being turbid, while in

¹ New York Medical Journal, vol. lxxi, No. 19.

² Boston Medical and Surgical Journal, 1896, vol cxxv.

³ Mittheilungen aus den Grenzgebieten der Medizin und Chirurgie, Bd. II.

⁴ Congress f. Innere Medizin, 1896, xiv.

⁵ Clinica Medica, 1899; Ref. in Archives de Médecine des Enfants, May, 1900.

⁶ Der Kinderarzt, 1897, viii.; Ref. in Pediatrics, vol. v., No. 3.

tuberculous meningitis it is always colorless. On the other hand, Wentworth, whose work has been very thorough, asserts positively that the fluid in meningitis is always turbid and never clear, although in tuberculous meningitis it may be necessary to compare the fluid with distilled water to notice the opalescence. The writer's rather limited experience bears out Wentworth's statement.

Fibrin, which does not form in normal fluid after it is drawn, is, according to Lichtheim¹ and Wentworth, always formed in meningitic fluid on standing. Felsenthal calls attention to this fact and to the comparison with fluid from cases of brain-tumor, in which fluid no fibrin forms. Further differential points, which may be here referred to, are that in tumor, sugar and albumin are present in normal amount, while in meningitis sugar is absent and albumin is increased. However, Freyhan² and Lenhartz could find no sugar in the fluid from tumor cases.

Blood in the fluid is of varied significance. Its most frequent source is a puncture of a bloodvessel by the needle, and this most commonly happens by the needle being pushed too far, in which case the venous plexus which lies behind the bodies of the vertebræ is injured. If the blood is in the first part of the liquid, the remainder being clear, traumatism by the needle is probably the source, especially if, as pointed out by Fuerbringer,³ immediate microscopic examination shows normal, unchanged erythrocytes. Other causes for an admixture of blood in the fluid are injuries to the head or spine, apoplexies, subdural or rupturing into the ventricles; occasionally meningitis (Councilman⁴).

The cellular elements in the fluid are, according to Wentworth, the cause of the turbidity; in tuberculous meningitis they are mainly small, round, mononuclear leucocytes; in purulent meningitis the polynuclear cells are in the majority. Endothelial cells are also present sometimes.

Of greater importance than the physical or chemical examination of cerebro-spinal fluid are the positive findings of bacteria; the importance of negative results in the search for them depends largely on the technique and skill of the examiner, so that, as a rule, the statement put forth by Stadelmann holds good, that positive conclusions can only be drawn from positive and never from negative results.

The following bacteria have been found in cerebro-spinal fluid:⁵

1. Staphylococci. Josias and Netter⁶ found the staphylococcus pyogenes aureus in a case of general infection, as did Wentworth.

2. Streptococci.

¹ Berliner klinische Wochenschrift, 1895.

² Ibid.

³ Congress f. innere Medicin, xv.

⁴ Transactions of the Association of American Physicians, 1897.

⁵ For the names of the observers and references up to 1898, the reader is referred to Neurath's review.

⁶ Gazette des Maladies Infantiles, 1899, No. 23; Ref. in Archives of Pediatrics, January, 1900.

3. Pneumococci. The Fraenkel-Weichselbaum diplococcus lanceolatus.

4. Meningococci. The Weichselbaum-Jaeger diplococcus intracellularis meningitidis. Of great interest is the finding by F. Schultze¹ of this germ in pure culture from the cerebro-spinal fluid of a five-year-old boy attacked with acute anterior poliomyelitis.

5. Typhoid bacilli. In all the literature but two findings of this germ are reported, the first by Lenhartz² and the other by Wentworth,³ who observed a case of typhoid fever in a girl four years old, the Widal test being negative on the seventeenth and twenty-first days; on the twenty-second day signs of meningitis developed, followed by death in fourteen hours. There was no autopsy, but a post-mortem lumbar puncture gave a turbid liquid containing many bacilli decolorized by Gram; cultures of this germ gave agglutination with serum from two cases of typhoid fever.

6. Bacterium coli.

7. Tubercle bacilli. With regard to the examination for this germ the extremes of opinion are represented by Monti⁴ on the one hand and Wentworth on the other. The former states that lumbar puncture furnishes no help in the diagnosis of tuberculous meningitis, and reports fifteen cases, in the fluid from none of which were tubercle bacilli found. Wentworth states that a general review of the literature convinces him that the technique is often at fault, and that with skill in examination, if this examination includes staining culture, and inoculation, positive results in meningitic fluid will almost never be missed. In this connection it is interesting to note (and the writer's own experience bears this out) that the cases of tuberculous meningitis in which the tubercle bacilli were not found were among the earliest examined, and it is safe to infer that as the skill of the examiner increases positive findings become more frequent. Thus, Lenhartz found the germs in the last nine of nineteen cases. His method is to let a bit of absorbent cotton sink to the bottom of the fluid, fish it out and tap it on the cover-glass, then staining for tubercle bacilli. The writer has found to be equally satisfactory the method recommended by Fuerbringer, which is to allow the fluid to stand for some hours until the slight net of fibrin which forms has sunk to the bottom; this is picked out with a platinum needle fixed on glass and stained. The method freest from exceptions, however, as urged by many writers, is the injection of the fluid into a guinea-pig, the objection being the time which must necessarily elapse, four to six weeks, before the results can be obtained.

The positive finding, by staining, of other bacteria than the tubercle

¹ Münchener medizinische Wochenschrift, September 20, 1898.

² Congress f. innere Medizin, 1897, xv.

³ Archives of Pediatrics, November, 1899.

⁴ Archiv. f. Kinderheilkunde, Bd. xxiv.

bacillus is open to the objection that these bacteria may not have the power of growth, and Stadelmann therefore urges that cultures and inoculations should always be made before positive conclusions are drawn.

The inability to draw positive conclusions from negative findings lessens the value of lumbar puncture for guidance in cases of brain abscess; evidences in the fluid of meningitis would, of course, contraindicate operation, but a negative result does not always exclude meningitis, for the reason that inflammation may have occluded the foramen of Majendie or the subarachnoid space at the base of the brain, and ependymitis or meningitis might exist without any evidence of the spinal fluid.

As a diagnostic means it remains to speak of the findings of Pfaundler concerning the pressure of the fluid. Space does not permit mention of all his results, but of importance is the characteristic curve which he describes for tuberculous meningitis, as follows: In the stage of brain-irritation, 48 mm. of mercury; in the stage of brain-pressure, 52 mm.; in the stage of brain-paralysis, 24 mm.; immediately after death, 11 mm.

THE THERAPEUTICS OF LUMBAR PUNCTURE. As a therapeutic means lumbar puncture may be either palliative or curative. When the pressure of the fluid, from any cause whatever, is so great as to threaten life, the lowering of this by lumbar puncture is a palliative procedure which may even be called temporarily curative, even in incurable conditions. This is often seen in tuberculous meningitis, the operation being followed by a comparative degree of comfort, with lessening of the headache, the cries and contractures. The operation has not settled yet the question as to whether recovery ever follows tuberculous meningitis, the case reported by Freyhan¹ still lacking confirmation, unless we except Fuerbringer's patient, who recovered, and in whose cerebro-spinal fluid tubercle bacilli were found, the diagnosis of the actual existence of meningitis in these cases not being absolutely established.

The influence of lumbar puncture on the course of epidemic cerebro-spinal meningitis is held almost unanimously by all observers to be beneficial, if practised early and repeated often. The case reported by Netter² will serve as an illustration: From the second to the thirty-seventh day eleven lumbar punctures were made at intervals of two to five days, 30 to 70 c.c. being drawn at each time. The first puncture gave a turbid fluid with a deposit of pus; the second, two days later, fluid with a slight sediment; and the third, fluid with a very small fibrinous flake. After this the liquid became perfectly clear, and the author is of the opinion that the withdrawal of pus probably was of benefit.

¹ Deutsche medicinische Wochenschrift, 1894.

² Archives de Médecine des Enfants, July, 1900.

Few observers have seen any good follow the operation in cases of brain-tumor, occasionally there being temporary lessening of the headaches and improvement in the choked disk. It is only in tumor, and that, too, only in adults that lumbar puncture has been followed by untoward results, a number of cases of sudden deaths having been reported. Noelke¹ seeks to explain these, in all of which the tumor had been situated at or near the base, by showing that the withdrawal of the fluid from the spinal canal allows the tumor to sink like a stopper toward the foramen magnum and to press on the vital centres.

The most that can be said for lumbar puncture in chronic hydrocephalus is that it accomplishes as much as ventricular aspiration, the value of either being doubtful.

Fear of favoring hemorrhage by lowering the pressure of the cerebrospinal fluid too much, and absence of beneficial results have led to the abandonment of the operation in apoplexy, hemorrhagic pachymeningitis, softening, and embolism.

Reports of the operation in uræmia are not numerous, and the beneficial results in some cases could not be positively ascribed to the puncture.

Seegelken² has reported a case of saturnine encephalopathy in which the coma and unilateral convulsions disappeared after lumbar puncture, and recovery followed.

In chlorosis the severe headaches have been relieved, according to many reports, by the withdrawal of as much as 70 c.c. of fluid.

After finding increased pressure in cases of infectious diseases, in which there were head-symptoms, Lenhartz, Stadelmann and others recommend the use of lumbar puncture after other means of relief have been unsuccessful.

In two cases of traumatism to the spine, followed by paraplegia, G. W. Jacoby³ removed by puncture bloody fluid, and rapid improvement followed.

With the above facts before us, it seems safe at present to draw the following conclusions :

1. Lumbar puncture has a wider field as a diagnostic aid than as a therapeutic means.

2. As an aid to diagnosis lumbar puncture is of value only when examination of the fluid gives positive results ; it is not safe to draw conclusions from negative results.

3. Therapeutically it is of value in epidemic cerebro-spinal meningitis to bring about recovery ; in tuberculous meningitis to promote comfort ; and in other conditions of excessive pressure to favor recovery by removing a condition immediately dangerous to life.

¹ Deutsche medicinische Wochenschrift, 1897.

² Münchener medicinische Wochenschrift, 1896.

³ New York Medical Journal, vol. lxi., 1895.

REVIEWS.

THE TREATMENT OF FRACTURES. By CHARLES LOCKE SCUDDER, M.D., Surgeon to the Massachusetts General Hospital, Out-patient Department; Assistant in Clinical and Operative Surgery in the Harvard Medical School. Assisted by FREDERICK J. COTTON, M.D. With 585 illustrations. Philadelphia: W. B. Saunders & Co.

FRACTURES. By CARL BECK, M.D., Visiting Surgeon to St. Mark's Hospital and to the New York German Poliklinik; formerly Professor of Surgery, New York School of Clinical Medicine, etc. With an Appendix on the Practical Use of the Röntgen Rays. With 178 illustrations. Philadelphia: W. B. Saunders & Co., 1900.

It is with a feeling of relief that we welcome two new books that treat of non-operative surgery. Operative surgery has occupied so much of the attention of the profession during the past fifteen or more years that the non-operative work has suffered from neglect. The development of antiseptic technique has so broadened the sphere of operative work that it has seriously encroached not only on the heretofore non-operative surgical affections, such as fractures, dislocations, hernia, etc., but even on what were regarded as medical affections proper—inflammatory affections of the region of the cæcum, typhoid fever, diseases of the kidney, and others. This operative advance has invaded the treatment of fractures, but to a limited extent only, and the bulk of cases still are treated by conservative measures. It is now four years since the announcement of the discovery of the X-ray by Prof. Röntgen, and its use has been sufficiently prevalent to cause the issue of some works on fractures which deal largely or almost entirely on this aspect of the subject. A dispassionate review of the results of the employment of the X-rays in fractures will convince one that our earlier expectations were too sanguine. While the information obtained by this method of examination is always of interest, and often of service both in diagnosis and treatment, in comparatively few cases is it absolutely essential. Inasmuch as X-ray examinations are expensive and only obtainable, as a rule, by those who have access to hospitals, it is evident that the bulk of fractures seen by private practitioners, particularly those located in the country districts, will have to be treated without the aid which they afford. On this account it is in the highest degree inadvisable to place too great reliance on them and neglect the other and more accessible means of diagnosis. It seems to me that there has been a lessening in the ability of our young men particularly in diagnosing the lesions in fractures. The internes of our hospitals, instead of establishing their diagnosis by a careful physical examination of the injured part, are too apt to defer making a diagnosis on the plea of not wishing to distress the patient, and rely on the X-ray examination.

In both the works before us skiagraphs occupy prominent positions. The work of Scudder and Cotton produces a favorable impression by the general manner in which the subject is treated. The volume is not intended apparently as an elaborate treatise, but rather as a handbook to which one can refer to obtain a reliable and modern method of treatment, and as such it is satisfactory. Its descriptions are concise and clear and the treatment sound. The physical examination of the injured part is well described, and in several cases, as in injuries of the elbow, wrist, and other parts, the method of making these examinations is illustrated by a liberal use of cuts. This makes the book particularly valuable to those who have not access to X-ray outfits. We believe the authors are right when they advocate in general the use of splints as a dressing in preference to plaster-of-Paris. The use of the latter in suitable cases is often alluded to and properly explained, but not to the exclusion of splints. It is certainly apt to prove unreliable in the hands of those not well accustomed to its application. The authors are not enthusiastic over the ambulatory method of treatment, and we again believe them to be right. The use of the Taylor hip splint is said to be of distinct value in fractures of the femur. The treatment may also be adopted in certain carefully selected cases of fractures below the knee, particularly of the fibula. The resort to operative measures is recommended in suitable cases. While not especially radical, the advice is sound. They advise in fracture of the patella that operation should be confined to healthy individuals under sixty years of age; to fractures with a separation of an inch or more of the bony fragments and extensive lateral fascial tears, and to cases presenting great distention that does not disappear quickly.

The question of the value of massage is hardly sufficiently insisted on. While the treatment of fractures solely by massage, as has been advocated abroad, is not to be advised, it is undoubtedly true that massage is not employed in this country in the treatment of fractures to anything like the extent it should be. Fractures are allowed to remain in splints or plaster for weeks without any attempt being made to prevent stiffness by the use of massage.

There is a separate chapter by E. A. Codman on the Röntgen Ray and its Relation to Fractures. In it particular attention is drawn to the necessity of avoiding mistakes in interpreting skiagraphs.

It is interesting to note that the authors advise the treatment of fractures of the elbow in the fully flexed position.

The book as a whole is mainly a reflection of the views of the authors and of the practice prevalent in their neighborhood. The work of others is comparatively seldom alluded to. As far as it goes the work is a good one; we like it, and think others will; but it is in a different class from the classic treatises of Stimson and Hamilton.

The work by Carl Beck is smaller than that of Scudder's, and still more narrow in its treatment of the subject. He dedicates his book "To Wilhelm Conrad Röntgen, without whose discovery much of this book could not have been written." He thanks Professor Röntgen for the many kindnesses extended to him at his laboratory, so that it is no surprise to find that great attention is paid to X-ray illustrations. The book is written essentially from the stand-point of one who relies largely on the uses of the X-rays in practice.

He defines a fracture as a solution in the continuity of a bone, and divides fractures into spontaneous and traumatic. This suggests the question whether it is not more correct to say that a fracture is a solution of continuity due to violence? A simple solution, such as occurs in caries, is no fracture, and in spontaneous fractures the breaking is still the result of violence; therefore, they, too, are traumatic fractures. From the fact that the author has already written a book on surgical asepsis, we might expect that his views as to operative procedures would be radical; but such is not the case. He says: "There has lately been observable a tendency on the part of a few surgeons to treat simple subcutaneous fractures by wiring the fragments. While under the auspices of asepsis such treatment need not be followed by any reaction, and might in the hands of competent masters give excellent results in suitable cases, such tendencies must be regarded as surgical aberrations. It is only where much diastasis is present, as in fractures of the patella (olecranon), when bony union appears improbable, that such vigorous interference is demanded. But by our recent means of making a positive diagnosis possible in all cases it is usually just as easy to obtain a perfect result by simple bloodless reduction and by thorough immobilization."

He states that massage is a splendid adjunct in the after-treatment of fractures, but to substitute it entirely for the good old immobilization treatment, as has been advocated recently, is not advisable. After mentioning some of the advantages of the ambulatory dressing, he proceeds as follows: "But these advantages are fairly offset by the immense difficulty in keeping the treatment under permanent control in practice. The technique of applying such dressings is complicated, and, therefore, dangerous in the hands of the inexperienced. In hospital practice, where continuous control is possible, the adoption of this method in many instances proves to be of great value. So, while this treatment is undoubtedly advisable in cases in which the dressing can be removed at any moment, in case ischæmic symptoms should manifest themselves, it should not be recommended for adoption in general practice."

In speaking of fractures of the condyles of the humerus he alludes to them as fractures of the epicondyles. What American anatomists and surgeons call condyles the Germans call epicondyles. To avoid this confusion of terms the reviewer, in the *Annals of Surgery*, January, 1899, suggested that one speak of intracapsular and extracapsular fractures of the condyles, and drop the name epicondyle entirely. Our author, however, speaks of intracapsular epicondylar fracture and isolated epicondylar fracture. In regard to treatment of fractures in the region of the elbow, he places them in almost any position and applies usually plaster-of-Paris, or sometimes wooden splints, and relies on frequent examinations by the X-rays to assure him that the fragments are in proper position. The utter lack of exactness and detail renders his descriptions of treatment of little value except to one who has already had an extensive experience. The same feature exists all through the book and impairs its usefulness for the general practitioner very much.

To sum up, the book will be valuable to those who wish to be informed as to the use of the Röntgen rays in the treatment of fractures, but as a guide for the inexperienced, either for treatment or to obtain

a general knowledge of the subject, it will be found too superficial and limited in both its descriptions and directions.

Both volumes are published in excellent style, on thick, highly calendered paper that brings out the illustrations well. G. G. D.

A MANUAL OF OBSTETRICS. By A. F. A. KING, A.M., M.D., Professor of Obstetrics and Diseases of Women and Children in the Medical Department of the Columbian University, Washington, D.C., and in the University of Vermont; Obstetrician to the Columbian University Hospital. Philadelphia and New York: Lea Brothers & Co., 1900.

A most excellent book. It could hardly fail to be and still reach its eighth edition. The clearness of expression and elimination of unimportant details which made the earlier editions so welcome to the student are still evident in the present volume.

The whole volume is good, but if it were necessary to pick out any particular chapters as better than the rest, those on Puerperal Sepsis, Mechanism of Labor, and the Jurisprudence of Midwifery would occur to one.

In the case of such a book, thoroughly satisfactory as it is for the most part, it seems almost a pity to criticise, and yet there are certain statements which cannot be overlooked. For instance, in speaking of the treatment of the pernicious vomiting of pregnancy, the statement is made that a woman can be nourished for weeks by rectal alimentation alone. This certainly is dangerous teaching, as it might readily lead the inexperienced practitioner to put too much trust in the rectal tube, and thus defer the induction of abortion until too late.

Again, the weight of testimony is certainly against the use of the vaginal douche after the completion of a normal case of labor. Exception must also be taken to the method advised by the author for the purpose of rendering the vagina sterile, experience having certainly shown that the use of a bichloride douche alone is not at all as certain as when it is preceded by a thorough cleansing with soap and water.

It seems unfortunate that more space was not given to the artificial feeding of infants, there being probably no more troublesome duty devolving upon the physician in the course of his obstetrical work. The space used in the description of the operation of laparo-elytrotomy might well have been so utilized.

One of the most unfortunate statements of the book is that it is impossible to reach the promontory in the normal pelvis. This, certainly a mistake, might well involve the student in serious difficulty. In this same connection the advice given to insert the whole hand in the vagina in order to measure the true conjugate can only be condemned.

The description of the operation of version and the indications for its performance is very good, but it is hard to understand why it is advised to grasp and bring down both feet if possible, as by so doing a much less efficient dilatation of the soft structures is secured.

It is also to be deplored that the author gave prominence to the preparations of iron in the treatment of post-partal bleeding, and it is to be hoped that no one will practice obstetrics without realizing that mouth-to-mouth insufflation is at least as good a method of resuscitation of

asphyxiated children as is Sylvester's. Why the author teaches that Cæsarean section is the treatment to be advised as a means of delivery at the moment of maternal death or shortly before is difficult to understand, as experience proves that version gives in such emergencies much better chances for saving the infant's life, and is particularly easy of performance, as the parts are relaxed by the approach of death.

The treatment of the lacerations of the perineum does not receive the attention which the unfortunate frequency of this injury would seem to warrant. It is true that a method of repair of median tears, both with and without involvement of the rectum, is given; but the student could hardly hope to treat this condition successfully if he had no more complete knowledge than is contained in the description of the author, since there is no method given for repair of the tears of the sulci, although they are more serious than the median tears, and much more likely to be met with than either the so-called second-degree tear of the external perineum or the tear involving the rectum.

W. R. N.

HAND-BOOK OF OPTICS, FOR STUDENTS OF OPHTHALMOLOGY. By WILLIAM NORWOOD SUTER, B.A., M.D. New York: The MacMillan Company. London: MacMillan & Co., Ltd., 1899.

THE pages of manuals upon the eye which deal purely with optics are, as a rule, scanned but cursorily by the average student of ophthalmology, as he shuns the study of this branch of his art as a thing full of symbols and signs, quite unintelligible to his intellect, and, as he thinks, without any particular value in actual practice. The reason for this indifference probably lies in the fact that hitherto it was possible to approach these fields only through the higher mathematics—channels too deep for the average brain. In the excellent little work before us Dr. Suter has solved these problems by means of simple algebra and elementary geometry alone, and has made the entire subject of optics understandable even to the student who approaches the study of ophthalmology with but little previous mathematical training. The book contains no more than every practising ophthalmologist should be familiar with, and we urge its careful study by all.

W. C. P.

REFRACTION AND HOW TO REFRACT, INCLUDING SECTIONS ON OPTICS, RETINOSCOPY, THE FITTING OF SPECTACLES AND EYE-GLASSES, ETC. By JAMES THORINGTON, A.M., M.D. With 200 illustrations, 13 of which are colored. Philadelphia: P. Blakiston's Son & Co., 1900.

DR. THORINGTON has the happy faculty of appealing directly to the student's mind when he writes, and the book before us will undoubtedly meet with the same favor as his earlier works on retinoscopy. Unlike the book which has just been reviewed, the author touches but lightly upon the problems of physiological optics, merely giving sufficient principles to make his remarks upon the refraction of the eye understandable.

His advice in regard to the treatment of anomalies in the extra-ocular muscle balance is conservative and sound; especially would we commend his caution in regard to the performance of tenotomies.

W. C. P.

THE REFRACTION OF THE EYE, INCLUDING A COMPLETE TREATISE ON OPHTHALMOMETRY. A CLINICAL TEXT-BOOK FOR STUDENTS AND PRACTITIONERS. By A. EDWARD DAVIS, A.M., M.D. With 119 engravings, 97 of which are original. New York: The MacMillan Company. London: MacMillan & Co., Ltd., 1900.

THE reviewer regrets that he is unable to extend the same words of praise to this work as he has to the two preceding. He views any work which contains in its preface the statement "that incidentally throughout the book I have endeavored to show the utter uselessness of a mydriatic in fitting glasses in the vast majority of cases, even in young subjects," a very dangerous guide to students of ophthalmology. Had the author entitled his book "ophthalmology," and had he limited himself to the exposition of the ophthalmometer, as it is with this phase of the subject of refraction that he chiefly deals, the work might, perhaps, have been acceptable. The author makes a point of inserting the histories of a number of illustrative cases to elucidate practical points in the use of the ophthalmometer, but, unfortunately, the majority of them are rendered worthless for scientific purposes by the meagreness of their data. The book has been published in a most attractive manner, which is unfortunate, as its appearance would lead the tyro to estimate it as a work of more importance than its text fails to substantiate.

W. C. P.

A MANUAL OF THE DIAGNOSIS AND TREATMENT OF THE DISEASES OF THE EYE. By EDWARD JACKSON, A.M., M.D. With 178 illustrations and 2 colored plates. Philadelphia: W. B. Saunders, 1900.

THE science of ophthalmology has been well expounded during the past decade by a series of remarkable text-books, so that there scarcely seems to be any need at present for an additional work upon the subject, unless every phase of it was treated in an original manner. The reviewer confesses to a degree of disappointment, therefore, in the book before him. Dr. Jackson is one of the best known of American ophthalmologists, and as his work heretofore has been characterized by originality, the profession has been led to expect that his text-book would bear this stamp, and that it would differ somewhat from other books of a similar character. The work, however, imitates its predecessors, and while the easy style in which the manual is written, and the explanations of the text, especially of that portion which deals with the refraction of the eye, make the work particularly acceptable to beginners in ophthalmology, it is to be regretted that the author did not embrace the opportunity of attempting a more comprehensive treatise.

W. C. P.

A TEXT-BOOK OF THE DISEASES OF WOMEN. By CHARLES B. PENROSE, M D., Ph.D., Professor of Gynecology in the University of Pennsylvania; Surgeon to the Gynecean Hospital, Philadelphia. Illustrated. Third edition, revised. Pp. 531. Philadelphia: W. B. Saunders & Co., 1900.

THE appearance of three editions of a text-book on gynecology within less than three years is a sufficient proof of its inherent excellence. Although we have already called attention to its peculiar value as a practical book for the student, we feel that the new edition should not be dismissed without further commendation.

Viewed from a teacher's stand-point, its most pleasing feature is the absence of any attempt on the part of the author to intrude his own fads. Keeping steadily in view the purpose so modestly expressed in the preface, "to avoid confusing the student" by the introduction of anatomical and pathological details, he has presented each subject so concisely and yet so lucidly that the beginner cannot fail to grasp the essential facts.

It has often been said that there is no call for new text-books on diseases of women, because they must necessarily be mere compilations from the old. But, while in one sense this is true, there is always room for one in which old matter is presented in a new and attractive form. The student has no time for theories and disputed points in practice. What he needs is a few facts which will *stick*. This point the author thoroughly understands, and he never loses sight of it.

The chapters on lacerations of the perineum and pelvic floor are models of accurate description and sound teaching, while those on uterine displacements admit of no criticism. Laceration of the cervix uteri, a subject the importance of which has been underestimated by foreign gynecologists, is admirably handled. The critical reader will be less pleased with the succeeding chapter on cervical catarrh. The present generation of medical students should certainly be grateful to the author for omitting the usual obscure discussion of the condition variously described as "chronic metritis," "areolar hyperplasia," etc. He wisely evades this issue in a sentence on page 200, viz.: "The pathological changes that take place resemble those occurring in chronic inflammation in similar musculo fibrous structures in other parts of the body." Uterine neoplasms are described in an especially pleasing way, and the subject of diseases of the tubes is presented in the most approved manner. We note with satisfaction the author's attitude toward conservative operations. His statement that "successful cases show the possibilities of surgery, but, unfortunately, they are exceptional," will meet with the approval of those who are not entirely carried away with enthusiasm for the prevailing fad. As an illustration of the writer's faculty of elucidating a difficult subject in a few well-chosen sentences we refer the reader to the section on pelvic suppuration on page 296. Other topics which are skilfully handled are diseases of the ovaries, diseases of the urethra and bladder, and gonorrhœa. The concluding chapters on operative technique and after-treatment are full of practical suggestions. We are surprised to note that the use of the ancient glass drainage-tube is still favored.

In conclusion we can only reaffirm our belief that Dr. Penrose, without making any pretensions to writing an extended work on gynecology, has rendered a distinct service to his generation by giving us what approaches very closely to the ideal text-book. We predict that its superiority will be widely recognized by teachers as well as students.

H. C. C.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

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Arteritis in Relation to Enteric Fever.—AUDEN (*St. Bartholomew's Hospital Reports*, 1898, vol. xxxv., p. 55) draws attention to the very rare occurrence of gangrene as a complication of typhoid fever. This is borne out by the fact that neither Trousseau nor Flint saw a case, and Murchison, in his long experience at the London Fever Hospital, met with only one instance.

Auden reports three instances in which this complication developed in typhoid patients treated at St. Bartholomew's Hospital during a period of eighteen months. In Case I. there was a thrombosis of the right femoral artery, followed by gangrene, and requiring amputation of the leg at the junction of the upper and middle thirds. In Case II. there was bilateral thrombosis of the popliteal arteries, causing gangrene and necessitating the amputation of both feet. Case III. was not one of actual gangrene. There was definite thrombosis of the left femoral artery, with cyanosis of the skin and the other usual accompanying symptoms, but without actual gangrene.

The writer has collected and tabulated eighteen other cases, making a total of twenty-one. Ferrand had collected twenty-three cases, but as six cases occur in both groups, it would make a total of thirty-eight cases. Auden's study is based on an analysis of these cases.

The most striking feature brought out is the frequency of the complication in early adult life. The oldest patient in the series was thirty-four, and only three had reached the age of thirty. It is to be remembered that a very large percentage of typhoid occurs between fifteen and thirty years of age.

The complication is practically twice as frequent in males as in females. Of the 38 cases no less than 26 were in males. This may in part be due to the greater frequency of typhoid fever in males than in females. From 1887 to

1897 the proportion of males to females with typhoid at St. Bartholomew's was 59.9 to 40.1.

The affection is almost always confined to the lower limbs. In only 3 of Auden's 21 cases were arteries of the upper extremity involved. The right leg is more frequently affected than the left. The complication is essentially one of convalescence, the average day of appearance being the thirtieth day. The mortality cannot be considered high for so severe a complication. Of the 38 cases death occurred in only 13, i. e., there were 65.8 per cent. of recoveries.

Concerning the origin of the gangrene there are two main theories. The shutting off of the blood supply is, according to Auden, due either to a primary arteritis, with the subsequent formation of a clot, or to the lodgement of an embolus, with the evidence in favor of the former. He admits that embolism is probably the cause in some cases, because acute endocarditis does occur in typhoid fever. It was present in 11 of the 2000 Munich autopsies. The tendency to dilatation of the heart in typhoid, with the consequent predisposition to clot formation, would favor the chances of the gangrene being due to embolism.

As already stated, Auden favors the primary arteritis theory as being the probable cause of the clotting and gangrene in most cases. Unfortunately he is not able to bring very substantial proof to support his belief. He points to the diffuse proliferation of endothelial cells in the minute capillaries of the intestinal walls, which eventually causes obliteration of the vessels and consequent necrosis of the Peyer's patches. He further refers to the observation of Mallory, who states that frequently during the regressive period, in the collection of cells beneath the epithelium, necrosis of large phagocytic cells takes place, and furnishes the starting-point for a very abundant formation of fibrin, which extends for some distance along the vessel, even reaching out into the lumen and dividing it into two or more channels. The cells of the blood current become entangled in this fibrin, and lead to the rapid formation of thrombi, which completely occlude the vessel. Auden thinks that this observation in connection with the intestinal vessels is of great importance, and believes that a somewhat analogous process occurs in the peripheral arteries. He believes that the path by which the arterial wall is infected is through the vasa vasorum, into which the bacteria pass. He admits that the finding of typhoid bacilli in the thrombus does not determine its embolic or autochthonous character, for it is certain that a clot forming as an infected area of arterial wall will itself become secondarily infected. Unfortunately there is no report of a bacteriological examination in any of the published cases.

The possibility of the thrombus being of the nature of a marantic thrombus or being due to blood changes is entertained.

Report on the Cases of Typhoid Fever Admitted into the Royal Victoria Hospital, Montreal, During the Year 1899.—GILLIES (*The Montreal Medical Journal*, June, 1900, p. 422) has analyzed the typhoid fever cases admitted to the Royal Victoria Hospital, Montreal, during 1899. In all, there were ninety eight cases admitted. Of these, eighty-six were treated to a conclusion, and the percentages given in the report are based on this

number. Of the remaining twelve cases several were cured, and the others were convalescent, and it is to be inferred that they still remained in the Hospital at the end of 1899.

The largest number of cases was admitted during the month of August, the smallest during December.

A few of the percentages given may here be referred to. The shortest, average, and longest duration of fever were eight, twenty-four, and fifty-eight days respectively.

The onset of symptoms was gradual in 95.4 per cent. of cases. Chills occurred at the time of onset or during the first week in 17.4 per cent. Diarrhoea was present at the onset in 20.9 per cent., and continued throughout in 8 per cent. Epistaxis and vomiting occurred at the onset in 18.6 and 34 per cent. of the cases respectively. Delirium occurred at the onset or during the course of the fever in 18.6 per cent of the cases.

An eruption was present in 72 per cent. of the cases. In one case the eruption was petechial; in all the rest it was of the nature of rose-spots.

The spleen was palpable in 67.4 per cent of the cases. A definite relapse occurred in eleven cases, or 12.7 per cent. The highest recorded temperature was 106.4°.

Acute bronchitis was present in 14.9 per cent.; periostitis developed during the attack in 1 case and in convalescence in another. Acute nephritis occurred in four cases. Cholecystitis occurred in three cases. Perforation of the bowel occurred twice, and intestinal hemorrhage in nine cases.

The Widal test was positive in all but four cases. In these it was negative throughout. Of these, three were regarded as abortive typhoid. No rose-spots were present. The reaction was present on the average on the eighth day. In one case it was not present till the eighteenth day.

Of the eighty-six cases, seven, or 8.16 per cent., died. Death resulted in three cases from hemorrhage, in one case from hemorrhage and perforation, in one case from perforation, and in two cases from profound intoxication.

The success in the treatment of typhoid fever at the Royal Victoria Hospital during the past six years has been very satisfactory, judging from the percentages of mortality. For the years 1894 to 1899 inclusive, the mortality was 3.5, 4.7, 0.0, 9.3, 4.3, and 8.16 respectively. During the six years 494 cases were treated, with 25 deaths, giving the low average mortality of 5 per cent.

A Report of Twenty-eight Cases of Suppurative Hepatitis. During the past twenty years twenty-eight cases of hepatic abscess were admitted to the Presbyterian Hospital, New York. Owing to the small number of sailors admitted for treatment these cases are believed to represent fairly well the local conditions giving rise to the disease.

STUART HART (*Presbyterian Hospital Reports*, 1900, vol. iv., p. 150), who reports the series, groups the cases as follows according to the path by which the infection has reached the liver: (1) Entrance by way of the portal vein, seventeen cases; (2) entrance by way of the hepatic artery, three cases; (3) entrance by way of the bile passages, three cases; (4) unclassified, six cases.

Of the seventeen cases in the first group, anatomical lesions of the alimen-

tary tract were found in ten cases at autopsy, and in the other seven the symptoms gave evidence of intestinal lesions. A point of interest is the fact that in not a single case were amoebæ coli found in the stools or hepatic abscess. In six cases the abscess followed ulceration of the colon or caput coli; three cases arose from ulcerative appendicitis; one followed ulcer of the stomach. One case was believed to be of typhoid origin, owing to the blood having given the Widal reaction and the typhoid organism having been grown from the contents of the gall-bladder.

In the second group the abscesses were a part of a general pyæmic process, two of them being secondary to malignant endocarditis and the third following puerperal sepsis. From other existing pathological processes there was a possibility of infection by way of the portal vein in these cases.

In the third group the common duct was occluded in the two cases by a calculus, which was regarded as the causative agent in both instances.

Practically all the twenty-eight cases had fever of an irregular type. Chills were usually present. Icterus was present in only six cases. Pain was absent in only three cases. Tenderness over the hepatic region was usually present. The enlargement of the liver was usually upward.

In eight of the twenty-eight cases the patients were moribund on admission, and death occurred in a few hours. Of the remaining twenty only three recovered: two after evacuation of the pus by operative procedure and one by rupture into the lung and expectoration of the contents of the abscess. In all fourteen cases were operated on, with two recoveries as stated.

Autopsies were obtained in twenty of the twenty-five fatal cases. In thirteen of these there was a single abscess, making, with the three cases which recovered and in which the abscess was considered single, a total of sixteen cases in which the abscess was single. The writer states that ten of the remaining twelve cases had multiple abscesses, but it is difficult to see how this was positively determined, owing to autopsies not having been obtained in all cases. In eighteen cases the suppurative process was situated in the right lobe, more frequently in the upper part.

Concerning the So-called Pericarditic Pseudocirrhosis of the Liver.—EISENMENGER (*Weiner klinische Wochenschrift*, 1900, No. 11) has made a critical study of this condition, from which the following conclusions may be cited: It is true that severe ascites without œdema of the legs frequently occurs in consequence of an adhesive or fibrous pericarditis. If the pericarditis is latent, the symptom-complex has a certain degree of resemblance to that of cirrhosis of the liver. The symptom-complex, however, is not produced, as F. Pick claims, by connective-tissue growth in the liver due to circulatory disturbance, but is due to different causes in different cases. Important are such things as twists, compressions, or kinks of the inferior vena cava by an exudate or by fibrous adhesions of the pericardium and mediastinal tissue, and coexisting peritonitis about the portal fissure; finally, the fact that the symptom-complex occurs especially in young individuals with normal capillaries and small vessels in the greater circulation, so that œdematous transudations do not easily occur. The symptom-complex described by Pick has no simple anatomical basis, and should, therefore, not be

looked on clinically as a single disease. In addition to this, the name proposed by Pick contains a diagnostic error, and should not be perpetuated.

SURGERY.

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Fractures of the Neck of the Radius.—MOUCHET (*Revue de Chirurgie*, May 10, 1900) points out the fact that these fractures have been shown by the Röntgen method of diagnosis to be much more frequent than has been supposed. They are particularly liable to occur in children between the ages of nine and twelve years. His observations are based upon a series of eleven cases which have come under his observation within a few years. They are not as frequently associated with other fractures about the elbow as has been supposed, but four of these fractures were associated with other fractures. They may be complete or incomplete, though the latter are rare. The line of fracture was through the neck of the radius or just below it, and may be transverse or oblique. The ligaments are frequently ruptured. The muscles are more or less ruptured, and there is always a swelling, which, however, is frequently due to extravasations between the muscles. The amount of displacement is variable, sometimes it is absent, sometimes there is impaction, usually the lower fragment is carried anteriorly and upward by the action of the biceps muscle, but there is generally a portion of the fractured surface in contact, though usually it is only slight.

The mechanism of the production of these fractures is generally that of indirect violence, and seldom, if ever, are they due to direct force.

The attitude of the patient is almost pathognomonic. The elbow is flexed at an obtuse angle or may be at a right angle. The hand is in pronation or semi-pronation and supported by the other hand. It is never in complete supination. There is a swelling of the forearm muscles, due to exudates and not to the displacement. It varies in amount. Ecchymosis is a late sign. Pain is probably the most constant and reliable symptom. Its position and the method of elicitation are, however, valuable adjuncts. Pressure upon the upper arm over the area of the radial head produces pain that is very limited, but very acute, and just in the region of the radial head and neck. The pain is increased by attempts at forcible supination. This pain can be easily distinguished from the general pain which any injury produces.

Abnormal mobility and crepitus are signs of little value, as they are frequently wanting. The movements that can be made by the patient are of prime importance. Supination to any extent is always impossible. This is, however, true of other fractures, but is a valuable confirmatory sign. One sign is not enough in any fracture. The radiographic examination will confirm these signs and add a precision and completeness to the diagnosis which are of extreme value. The skiagraphs must, however, be made with proper care and by a person who understands the surgical possibilities, or else they may be of little value. They should be taken in more than one position if a fracture is to be excluded. The diagnosis is not easy without the skiagraph, and errors are liable to occur frequently. The confusion can readily be made with fracture of the external condyle and forward luxation of the forearm or radius. Where the fracture and deformity are of long standing the diagnosis would be impossible except for the aid given by the Röntgen method of diagnosis.

The treatment should be very simple: by massage and passive motion. Reduction is often impossible, and it is always impossible to maintain the bones in position, no matter what bandage or splints are employed; while their use is liable to produce a restriction in motion and to destroy the function of the joint; the latter will be maintained by the treatment without bandages or splints. If, in spite of all treatment and massage, there remains functional loss, or this is the result of an ancient and vicious union, the surgeon should not hesitate to cut down and remove the head of the radius. The results of such intervention are usually very good.

Cancer of the Breast.—BANKS (*Lancet*, April 7, 1900), in speaking of the operations for cancer of the breast, says of the very radical and extensive operations, that he does not believe it necessary to remove the sternal portion of the pectoralis major and to divide the pectoralis minor and reflect that muscle in order to remove all the glands of the axilla. If the arm be properly manipulated and the great pectoral well dragged upward and inward the very topmost point of the axilla can be cleaned out. Moreover, if there is any doubt at all, the great pectoral can be cut across with very little trouble and then stitched together with catgut sutures, as he has frequently done. With an experience of 250 operations he has given up attempting to get any good out of cleaning out the supraclavicular region. When cancer has laid hold of the supraclavicular glands it has got such a grip as to be past extirpating. It is like a burning house—when the fire is beginning even some buckets of water will put it out; when it has got to a certain pitch a whole fire brigade will not quench it. It is clear that in both classes of operation the majority of fatal cases die from internal metastases without external recurrence, and against these no operation can protect. The swing of the pendulum of surgical opinion is generally too extreme, and has now turned from too slight to too extensive operating. The author has never seen a recurrence in the small pectoral muscles; in the great they creep into it from the subcutaneous tissues and pectoral fascia. They do not primarily originate in the muscle. There is, therefore, no need for its removal on that ground.

The operation which he advocates is one in which an elliptical incision

wide of the tumor and of the entire breast is made, with an undercutting, so that the subcutaneous tissues are removed over even a more extensive area than the skin; it reaches even to the sternum. The skin should be particularly freely removed on the side on which the seat of the growth lies. He believes its extension is frequently through the skin, and it is in the skin that most external recurrences are found. The axilla should be opened by an incision just under the edge of the great pectoral, and the whole gland and contents of the cavity, as far as they can be held together, carried away in one mass. The importance of this lies in the fact that recurrence in the axilla takes place for the most part not in the glands that are left behind, but in fragments of lymphatic vessels. A good plan is to get hold of the axillary vein, and then there is nothing else to trouble about. One must take matters very patiently, getting everything out of the cavity that can be got and cleaning up the digitations of the serratus magnus. He uses no knife in the axilla, but two very long, strong pairs of dissecting forceps and curved probe-pointed scissors. He makes a drain-hole just above the edge of the latissimus dorsi in the lower flap, and puts gauze drains through it and also in the upper angle of the axilla. He employs asepsis, pouring hot water over the wound frequently during the operation, and sees that the wound is dry of blood.

Surgery in the Presence of Sugar in the Urine.—FISK (*Annals of Surgery*, April, 1900) reports a number of cases in which he operated successfully in the presence of sugar in the urine. He reviews the literature of the subject and draws the following conclusions: The presence of glycosuria in those individuals who may have surgical diseases does not in itself constitute an absolute contraindication to any and all surgical relief. Very great judgment must be exercised in the selection of cases, in the determination of the kind and extent of the operation to be performed, and the strictest surgical asepsis must be rigidly enforced throughout. Infection, when it occurs, is from without, and is the result of an error in technique; it thus happens the constitutional symptoms become more serious and out of all proportion to the local, generally ending in death. When infection does not occur the operative wounds heal kindly, but slowly, especially granulating wounds. The vascularity of the tissues must be interfered with as little as possible, so that every operation should be planned with this object in mind. This is particularly so in gangrene of the extremities, in which the statistics of Heidenheim, Kuster, and Smith and Durham show most conclusively the necessity of high amputations in these conditions. He is of the opinion that it is better to cut down upon and ligate the artery in gangrene of the extremities rather than to attempt the bloodless amputation by means of the Esmarch band, because of the possible harm to the tissues, especially the bloodvessels, whose vitality is not the best.

A Method of Early Operation in Perityphlitis.—KOCHER (*Korrespondenzblatt für schweizer Aertze*, April 15, 1900) describes a new method of operating by which the suppuration present in cases of perityphlitis can be immediately relieved without endangering the peritoneal cavity, while the operation can be made radically complete by the removal of the appendix

at an early date and a secondary operation under absolute asepsis, without any danger of infecting the peritoneal cavity.

The method has been successfully employed for some time by Prof. Kocher, and is advanced as a solution of the problem which is met with in cases where the inflammation is known to be progressing and possibly to have formed pus, but where there is grave danger in operating immediately by the usual methods, since the adhesions already formed may be too slight to permit the operation without grave danger of infecting the general peritoneal cavity. On the other hand, there is a real danger in inaction, as the adhesions may rupture during the rapid increase of the abscess.

Kocher favors immediate operation as soon as the diagnosis has been established. The majority of cases are seen by the surgeon, however, after a delay has resulted in the hands of the general practitioner. It is in these cases that immediate operation is dangerous, and in which Sonnenburg advises extraperitoneal operation, believing that intraperitoneal operation at this time and diligent search for the appendix are very dangerous. Kocher's method consists, in reality, of two operations—the first is extraperitoneal and antiseptic; the second is transperitoneal or intraperitoneal and aseptic.

The first operation opens the abscess within the area of adhesions by the extraperitoneal route. The pus is evacuated and the abscess tamponed with iodoform gauze, and after draining for two days, until the toxæmia and threatened septic condition of the patient has subsided, when the second or radical portion of the operation is undertaken. The drainage opening is packed with iodoform gauze and closed with sutures. The line of the wound is painted over with iodine and then covered with a sterile dressing. The operation in this part has been antiseptic in character. After careful cleansing of the abdomen, with the regular antiseptic precautions, an incision is made as in appendix operations during the interval, the peritoneum is opened under strict asepsis and the appendix removed. In breaking up the adhesions the abscess cavity is naturally opened, only very little exudate, however, is encountered, and the virulence of the bacteria in this is greatly diminished. In many cases no fluid is found, only fibrous adhesions. After the appendix is removed and the stump covered in and all exudate carefully sponged away the abscess cavity can be closed again, as drainage is afforded by the wound of the first operation. The abdominal wound is closed without necessity of placing gauze drainage in it. The upper layers of the wound are, however, allowed to remain open for two days and then closed by secondary suture. The abscess wound is kept open and allowed to heal by granulation. The two wounds are dressed separately; one aseptically, the other antiseptically, conforming to the methods of operating employed.

A valuable feature of this method of operating is that it permits of bacteriological examination of the pus in the abscess, so that the relative virulence of the infection can be determined before the peritoneum is opened at the second operation. It has been found that there is less danger of further infection in cases where the colon bacillus or the pneumococcus is found than where the staphylococcus, the streptococcus, or a mixed infection is present. The bearing of such information upon the second operation is very

evident. In cases of the milder infection the peritoneum can be depended upon to take care of a slight infection during the second operation. In the graver cases the utmost care has to be exercised.

This operation has the advantage of producing an abdominal wound free from drainage areas, which statistics show lessens very greatly the danger of post-operative hernia.

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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Tuberculosis of the Genital Tract in Children.—MARTHA WOLISTEIN (*Archives of Pediatrics*, May, 1900, p. 347) records a very complete autopsy upon the body of a child, two years old, an inmate of the Infants' Hospital on Randall Island. There was no clinical history other than that the child had had measles, followed by persistent cough and emaciation. A purulent vaginal discharge had been noticed for several weeks before death, but no bacteriological examination had been made. Miliary tubercles were scattered throughout the substance of all the lobes of the lungs; the bronchial lymph-nodes were all enlarged and cheesy, not softened; there were a few small tubercles in the liver, many in the spleen. The peritoneal surface of the rectum was covered with a fibrinopurulent exudate and studded with tubercles, which were scattered all over the pelvic peritoneum. In the right broad ligament was a fluctuating mass, 4 x 6 cm. in diameter, distinctly separated from the uterus, and at first sight obscuring the right tube and ovary. This mass contained green pus, and had bent the right Fallopian tube out of its course. The corresponding ovary contained cheesy material. The left tube was dilated to three times its normal size, but the ovary was normal. Both tubes contained cheesy material. The uterus was normal in size, and its mucous lining healthy in appearance; the serous coat contained many small tubercles. The cul-de-sac of Douglas was occupied by a pocket of pus. Some purulent exudate was found in the vagina, preparations from which contained tubercle bacilli in small numbers and groups of cocci not decolorized by Gram's stain. Tubercle bacilli and staphylococci were also found in the pus of both collections in the pelvis; no gonococci were present.

It was clear, both from the gross appearance and the microscopical study, that the oldest tuberculous lesion was one of the bronchial lymph-nodes, the youngest in the lungs, spleen, and liver; the Fallopian tubes, pelvic peritoneum, and right ovary became involved, in the order named, before the other viscera. Seventeen cases of tuberculosis of the female genital tract

in children, including the author's, have been reported since Talamon's. Only one (Demme's) was less than a year old; five were between one and two years; five between two and three; three between four and five; two were six; one was nine, and one thirteen years old. No pelvic abscess is noted in any of the other cases; the present case is unique in this respect.

The order of frequency of involvement of the different organs differs slightly in childhood from that given by Williams for adult life, and is as follows: tubes, uterus, vagina, vulva, ovary, cervix. The lesion may be primary or secondary, nine of each variety having been reported. Primary infection may occur by direct contact of bacilli with the vulva or vagina; or the organism may be carried primarily to the tubes or uterus by the blood, without the appearance of any lesion at the point of entrance. Secondary infection may occur from a primary lesion in any part of the body, and may affect the genital tract directly, as in the case of a year-old baby reported by Coustensoux, where the tracheobronchial lymph-nodes were the oldest seat of the process, and the Fallopian tubes were involved before the peritoneum.

Differential Diagnosis Between Typhoid Fever and Appendicitis.—S. WEISS, of Vienna, in a communication read at the recent meeting of the American Medical Association (*Medical Record*, June 23, 1900, p. 1100), states that if a drop of blood taken from the lobe of the ear be treated with iodine, the red corpuscle in health becomes yellow and the white cells are unaffected. In disease, however, the multinuclear cells are stained, while the eosinophiles are unaffected. This reaction always shows the presence of pus. Cases of appendicitis and perityphlitis could therefore be differentiated, by means of this reaction, from typhoid fever.

Vaccinal Immunity in the New-born and its Intra-uterine Transmission.—Some interesting facts bearing upon this question are presented in an experimental study by PIÉRY (*Lyon Médical*, May 13, 1900, p. 37) in which are recorded observations upon fifty-nine cases of vaccination practised concurrently upon the mother and her infant. The mothers were vaccinated once, and upon the infants the operation, if unsuccessful at first, was practised a second time.

Of fifty-nine infants, thirty-six were refractory to vaccination, while twenty-three were vaccinated with success. Of the thirty-six mothers whose infants were thus immune, thirty-two showed themselves refractory to vaccination, and thus proved themselves possessed of the same immunity. Only four infants whose mothers had been vaccinated with success after parturition, and were therefore in a state of receptivity at the time of the infant's birth, manifested immunity when subjected to the test. This conclusion strongly confirms the observation of Bécère, Chambon, Ménard, and Coulon, who found in a series of sixty-five mothers and infants that immunity in the infant was manifested exclusively by those whose mothers showed the same insusceptibility. The author believes that his four exceptions to the rule stated by these observers are scarcely numerous enough to invalidate its truth.

If, however, intra-uterine transmission of immunity in the mother accounts for the immunity of the child, it does not follow that all mothers

thus protected are able to transmit a like immunity to their offspring. In the author's statistics it was noted that while thirty-two mothers transmitted immunity to their offspring, seventeen others bore children who were susceptible to vaccinal inoculation. An interesting observation not included in the series concerned a woman vaccinated without success after a twin birth, who transmitted her immunity to only one of her infants, the other presenting a normal pustule after vaccination.

Combining his results with those of previous observers, Piéry finds that transmission of immunity may be observed in 58 per cent. of the cases.

The reason of the inconstance of transmission of immunity is attributed by Bécclère and his associates to the existence in certain subjects, immunized to vaccinia, of a certain anti-virulent property of the blood. When the blood of such persons is intimately mixed with vaccine virus the latter loses its active properties. They, therefore, conclude that the transmission of vaccinal immunity to the infants is observed only among women whose blood possesses this antitoxic property.

The intra-uterine transmission of immunity to vaccinia is observed among mothers who have been vaccinated during their early infancy as well as during their pregnancy. Judging from his own cases, the author is disposed to conclude that transmission is more frequently observed among the former class. Of five women vaccinated successfully during the last fifteen days of their pregnancy, and whose pre-existing immunity was therefore disproved, only one transmitted immunity to her infant, which gives a proportion of 20 per cent. as representing the frequency of transmission of immunity acquired in the last fifteen days of pregnancy. On the other hand, of forty-four women enjoying an immunity dating from vaccination practised in their infancy, thirty-one transmitted it to their infants. This would give a proportion of 70 per cent. among the mothers whose immunity was acquired in their own infancy. This observation also bears out the statement of Bécclère and his associates, that the antitoxic quality of the mother's blood-serum is manifested when she has acquired immunity either in early infancy or during pregnancy.

In conclusion, the author states that he does not regard pregnancy as a contraindication to vaccination, since he has observed no appreciable disturbance in any of the pregnant women he has vaccinated.

THERAPEUTICS.

UNDER THE CHARGE OF

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Gout and Rheumatism: Etiology and Dietetic Treatment.—DR. W. H. PORTER believes that defective oxidation is a chief predisposing factor, resulting in one instance in rheumatism and in another producing gout.

The suboxidation state is due chiefly to the ingestion of oxidizable food products in larger amounts than there is oxygen absorbed through the lungs completely to reduce the proteid constituents to their end-products. Further, diminished food supply of poor quality may cause suboxidation; in this case progressive malnutrition causes anæmia, and with it insufficient oxygen occurs. A discussion of various theories to account for the formation of uric acid follows, with support of the idea that uric-acid production results from oxidation of proteid substances in the protoplasm of the renal cells. When the amount of oxygen taken up by the lungs is diminished, oxidation of the proteids falls to an abnormally low point, the excretion of urea decreases, and that of uric acid increases. If carbohydrates or fats are taken in large amounts, the oxygenating capacity of the body is exceeded, suboxidation results, and uric acid increases in the urine, while urea diminishes. Thus increase of uric acid in the urine is a symptom indicating an imperfect proteid oxidation and general malnutrition. When the renal cells cease temporarily to act, failing to produce uric acid, a vicarious process occurs in the tissues, oxygenation of proteid substances forms uric acid in the tissue cells, and sodium urate immediately results. This more frequently occurs in the cartilage cells of the first metatarso-phalangeal joint. Urate of sodium acts as an intense chemical irritant, exciting a local inflammatory process; a fibrinous exudate is thrown around the deposit, and the local symptoms subside.

Non-nitrogenous food products are directly oxidized to carbon dioxide and water, yielding no toxic bi-products; therefore the proteids are the source of these toxic and suboxidative conditions of the system. Confirmation of the reported observations on a specific germ for rheumatism is lacking. Probably, however, with overfeeding, bacterial action has much to do with many types of suboxidation, through their disturbing influence on digestion. It may be that they are the factors determining whether the form of suboxidation is to be rheumatism or gout. The bacterial action is on the proteid constituents as they exist in the chyme, for the most part. Animal food is more easily digested than vegetable, but this renders the former more prone to suboxidation, unless the amount taken is restricted so that it is kept well within the oxygenating capacity of the system. Vegetable foodstuffs are more difficult to digest, absorb, and assimilate. There is less danger of exceeding the oxygenating capacity of the system on a vegetable diet, because a large proportion passes through the alimentary canal undigested. Thus good results often follow a strict vegetable diet. The large amount of waste material of a vegetable diet often causes diarrhœa. A catarrhal mucous membrane results and offers a good nidus for bacterial growth, with undue putrefactive fermentation. Cane sugar has to be converted to glucose before absorption occurs—an excessive tax on digestive energy. If these unpleasant results do not ensue much benefit may be derived from a vegetable diet. Fruits, as a class, are to be avoided, being liable to cause fermentation.

Best results follow a mixed diet in which animal food preponderates. The total amount of food ingested must never exceed the oxygenating capacity. Suitable medication to augment glandular action (digestion) should be added.—*New York Medical Journal*, 1900, No. 1112, p. 411.

Observations and Suggestions Concerning Hypodermoclysis.—DR. ROBERT C. KEMP recommends the space between the highest part of the crest of the ilium and the lower border of the ribs toward the outer margin of the lumbar region as the site of election. Dorsal posture is not interfered with, nor do muscular or respiratory movements cause discomfort. Strength of solution, one drachm of sodium chloride to one pint of water. Everything connected with the operation must be aseptic. The specific effect on renal secretion produced by small quantities of normal saline solution appears rapidly. When irrigations were given and potassium ferrocyanide was added to the solution the urine gave a blue reaction with ferric chloride in less than two minutes, and in addition there was increase of urinary flow. If hypodermoclysis be practised a similar reaction can be obtained in less than four minutes, with an increase in renal secretion. Enormous increase of urine may follow small rectal injections frequently repeated. Small quantities frequently given subcutaneously act as a better diuretic, causing less strain on the kidneys than a pint thrice daily. By thus increasing the urine excretion of injurious substances is provoked, as in acute diseases. A saline enteroclysis (110° F.) gives the following:

1. An immediate increase in arterial tension. If the temperature of the injection is under 110° F. this result does not follow.

2. At the expiration of ten minutes this stimulation seems to reach its maximum point; arterial tension remains then unchanged.

3. Increase of renal secretion begins after ten minutes, coincident with the increased arterial tension.

4. At the same time there is an increase of blood (?) and body temperature.

5. A second marked increase of renal secretion occurs at the end of twenty minutes' enteroclysis, due to absorption from the intestine. In uræmia, shock, etc., lymphatic absorption is nearly at a standstill; even a small hypodermoclysis requires a long time for absorption; in addition there is no stimulating effect from heat.

Saline solution distributed over a large surface, as the peritoneum, either by enteroclysis or enema, has no resistant tension to overcome. There is a wide-spread area for absorption, together with reflex stimulation of the circulation by heat, and, hence, rapid lymphatic absorption. Thus the action of a hypodermoclysis can be much hastened by a simultaneous hot enema or enteroclysis at 110° to 125° F. In hemorrhage from typhoid and gastric ulcers, hypodermoclysis replaces fluid. It enters the body slowly through the lymphatic system, and is less likely than infusion to cause an increase in hemorrhage. Hypodermoclysis is recommended in various forms of poisoning, especially when the drug is eliminated through the kidneys. In pleurisy with effusion, with renal insufficiency, hot enteroclysis may produce sufficient diuresis to absorb the effusion without aspiration. Then follow recommendations for the use of hypodermoclysis in the colitis of infants, in nephritis complicating diphtheria, with oliguria, in uræmia, and in the preparation for operation of a patient who is suffering from shock.—*Medical Record*, 1900, No. 15, p. 623.

Hepatic Engorgements.—DR. J. GUERDER, studying the subject with reference to their occurrence in pulmonary tuberculosis, sums up his treat-

ment as follows: (1) Revulsions comprise mustard poultices, tincture of iodine, dry or wet cupping, and even blisters. (2) Intestinal antiseptics is obtained with salol or naphthol; but if these are badly borne, daily evacuations should be secured by calomel, or, preferably, podophyllin, rhubarb, aloes, or purified ox-gall in three to five-grain doses. (3) Food which contains toxin should be avoided. Tea, coffee, and alcohol should be forbidden. Milk and its preparations are recommended. With the milk Vichy can be taken. (4) Opothorapy has given good results in two recent instances. Enemata of hepatic extract were employed. Inasmuch as the author looks upon hepatic insufficiency as the predisposing cause of pulmonary tuberculosis, this treatment is important.—*Revue de Thérapeutique Médico-Chirurgicale*, 1900, No. 8, p. 253.

Expulsion of Gallstones by the Use of Sulphur Water.—DR. AXEL WINCKLER reports an instance of the expulsion of fifteen stones after the use of twelve ounces of sulphur water (Bad Neundorf), aided by sulphur baths. The explanation is that sulphur water increases the secretion of the bile. Neundorf water contains 4.5 per cent. of hydrogen sulphide, and in that respect is the strongest sulphur water in Europe. After the expulsion of the stones the use of the water should be persisted in, so that the bile may be kept fluid.

In this connection attention is called to the fact that extensive use of eggs may readily be the cause of the condition, and a cause frequently overlooked. The yolk contains cholesterin in the amount of one-half of 1 per cent., while gallstones are nearly 8 per cent. cholesterin. Bread and the seeds of cereals contain this substance also, and should be limited in quantity.—*Therapeutische Monatshefte*, 1900, Heft 5, S. 246.

Diabetes Mellitus and its Treatment.—DR. GEORGE D. BARNY considers the dietetic treatment of great importance, the object being to exclude sugars, starches, and other glucose-forming bodies. Sometimes a certain small amount of sugar is requisite to maintain the best state of health. Gluten bread is permissible. Almond flour is a fair substitute for wheat flour. Soups can be made without starch. Fish, poultry, game, and meats, except liver; a variety of vegetables containing smaller amounts of starch. Tea and coffee are sweetened with saccharine or glycerin. Diabetics are very susceptible to cold and require a warm environment. The disease is evidence of a grave malnutrition, primarily due to perverted nervous function. The liver performs much of its normal work, but it loses the control of the glycogenic centre. Glucose is formed more rapidly, and there is an increase in the destruction of the red blood-corpuscles. Intestinal bacteria and unchanged peptones from the stomach enter the blood. All tissues lack sufficient food. Indications for treatment are to regulate the nervous influence, improve the blood and circulation, prevent the invasion of micro-organisms and inhibitory products. The double bromide of gold and arsenic combines the tonic alterative elements of the two metals and the sedation of bromine. It restores the integrity of the glycogenic centre; it increases the vascular tone and limits the amount of blood supplied to the liver. Digestion is improved, and nutrition likewise. The quantity of sugar is notably diminished;

thirst likewise. Mental depression disappears. It should be given after meals, beginning with five drops, and increasing one drop daily until toleration ceases; toxic symptoms are as for arsenic. Patients vary; some will take only ten drops, and others thirty or forty. Appended are urinalyses from three patients. In all the quantity rapidly diminished to far below normal (twenty-seven ounces). Specific gravity from over 1030 to 1017. There was no albumin present at any time. Sugar, which was present (more than 1.5 per cent. in each), disappeared wholly after ten weeks, with no subsequent recurrence. Weight was not affected. Weekly blood examinations were made in two instances, and showed secondary anæmia, which improved in all respects under the above treatment.—*New York Medical Journal*, 1900, No. 13, p. 463.

Hyoscine.—DR. HENRY S. NOBLE, after many years of constant use of this drug among the insane, has reached the following conclusions: (1) All patients do not behave the same under its administration. In acute or recurrent excitement two or three of every five will be benefited, and in the recurrent form of insanity attacks of maniacal excitement are frequently averted. (2) Old people, particularly in feeble health, are more profoundly affected by even moderate doses. (3) It is just as efficacious by the mouth as hypodermatically, although its action is not quite so rapid. (4) A tolerance is not established except within limits. If, after increasing the dose to one-sixtieth of a grain, the desired effect is not obtained, it is useless to increase it further. (5) Frequent doses are not required; two in twenty-four hours being usually sufficient. (6) It does not act as a hypnotic except in a peculiar way, wholly different from chloral, opium, cannabis indica, sulphonal, or paraldehyde. It produces sleep normally by allaying cerebral excitement and morbid motor activity. It may be combined with potassium bromide or chloral. (7) Nothing like curative effects have been obtained. Instances of recurrent insanity and *folie circulaire* may be kept in the convalescent wards by its judicious use which otherwise would have spent fully one-third of their time in the excited wards. Its tastelessness permits it being introduced surreptitiously into the patient's coffee should he refuse to take his medicine. For the initial dose one-hundredth of a grain is sufficient.—*Yale Medical Journal*, 1900, No. 8, p. 323.

A Practical Method of Administering Trional to the Insane.—DOTT. CORRADO FERRARINI employs an effervescent magnesia solution, which not only is a convenient method, but also permits a smaller dose. An effective dose varies from seven to fifteen grains; its more easy absorption in the presence of carbon dioxide is the reason for the smaller dose. Further, when thus administered gastric and intestinal disturbances, so readily excited in the insane, are avoided.—*La Riforma Medica*, 1900, No. 109, p. 402.

The Treatment of Alcoholism.—M. CRIVELLI has obtained much relief and produced many permanent cures by the following method: At the outset injections of artificial serum, later absolute rest, baths, massage, limited diet, coffee, and finally hypodermatic injections of strychnine in 1 per cent. solution, commencing with three drops twice daily, and increasing two drops

each day until the appearance of the first symptoms of poisoning, which generally occur after twenty to forty drops, representing three to five sixty-fourths of a grain. The dose is then gradually reduced to the initial one.—*La Progrès Médicale*, 1900, No. 19, p. 295.

GYNECOLOGY.

UNDER THE CHARGE OF

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Palliative Operation for Inoperable Carcinoma Uteri.—KÜSTNER (*Centralblatt für Gynäkologie*, 1900, No. 14) recommends the following procedure, which he has adopted successfully in cases of advanced cancer of the cervix. After thorough curettement and cauterization of the diseased area a tampon saturated with alcohol is applied to the raw surface. A large transverse opening in the recto-vaginal septum above the sphincter ani is made, and its edges are sutured with catgut. A long thread attached to the tampon is carried through the fistula and brought out at the anus.

Kolpokleisis is next performed, the vulva being closed with sutures of silkworm-gut, the denuded surfaces being made as broad as possible. The tampon is withdrawn through the anus on the fourth day. As the external wound may not heal perfectly, additional sutures may be required subsequently. It is advisable to irrigate the vagina occasionally through the fistula and to dilate the latter with the finger if it becomes contracted. In case of hemorrhage the vagina can be tamponed (through the fistulous opening?) or irrigated with cold (?) water.

The writer states that patients are considerably benefited by this operation, being relieved of the constant acrid, foul-smelling discharge.

[The writer does not appear to take into consideration certain dangers which may follow closure of the vagina, especially that of septic infection from the retention of discharges and fecal matter in the pocket below the fistula. The difficulty of arresting a profuse hemorrhage from the ulcerated surface after kolpokleisis has been performed may readily be imagined.—H. C. C.]

Specific Micro-organisms in the Female Urethra.—SCHENK and AUSTERLITZ (*Wiener klinische Wochenschrift*, 1900, No. 14), from bacteriological examinations in sixty normal cases, found no germs whatever in one-half and pathogenic germs in only two instances. Savor found in 93 gynecological patients who had not had gonorrhœa that germs were present in the urethra in 59, staphylococcus pyogenes in 22, and colon bacteria in 14. In 120 pregnant women the urethra contained the same varieties of micro-organisms in all but two cases. The writers arrive at a different conclusion, believing that pathogenic germs are rarely found in the normal female urethra, and

that none are present in over 50 per cent. of cases of pregnant and puerperal women. Most of these germs are saprophytes.

Steam in the Treatment of Endometritis.—JOHNSON (*Boston Medical and Surgical Journal*, 1900, No. 11) reports thirty-one cases in which he used this agent successfully. He introduces steam into the uterus from an ordinary throat atomizer (after the cervix has been dilated with thorough aseptic precautions) through a hard-rubber tube, which is removed after thirty seconds, the uterine cavity wiped out with gauze, and the steam again introduced for thirty seconds. The patient is kept in bed from four to six days. The temperature of the steam is never above 212° F.

The advantage of steam over the curette lies in the fact that it acts only on diseased surfaces in puerperal septic cases, while in cases of chronic hyperplastic endometritis the entire endometrium is affected, while even after thorough use of the curette islands of diseased tissue are often left.

Exact clinical evidence was obtained by the author by removing uteri after they had been steamed for different periods and examining them microscopically. It was found that after introducing the steam in the manner above mentioned the endometrium was destroyed, but the muscular tissue was not affected, as was the case when the operation was prolonged beyond a minute. With a longer exposure there is considerable risk of subsequent obliteration of the uterine cavity.

Torsion of the Fallopian Tube.—HARTMANN (*Comptes Rendus de la Soc. d'Obstétrique de Gyn. et de Pædiatrie*, February, 1900) adds five cases to the ten previously reported. In seven of these the tube alone was twisted, while in five the ovary shared in the torsion. In ten the right tube was affected. In some cases the tube was previously diseased, while in others the pathological changes present (especially hemorrhages) were due to the torsion. The vessels in the pedicle were nearly always filled with thrombi.

Clinically the symptoms noted were sudden pain, simulating appendicitis or intestinal obstruction; or successive attacks occurred like renal colic, the latter being in cases of gradual torsion. Localized peritonitis and a rapid increase in size of the affected tube were constant.

Obesity as a Cause of Sterility.—PAOLI (abstract of thesis in *La Gynécologie*, February 15, 1900) calls attention to the fact that obesity is often associated with malformations in the genital tract, nervous and vascular disturbances, and errors in secretion. Hence results painful, scanty, and irregular menstruation, infrequent conception, and if this occurs abortion is common. Sterility in fat women has been variously attributed to pelvic lesions and arthritic troubles. Treatment of sterility in such subjects should be reserved for cases in which disturbances of secretion are marked. If congenital malformations exist the prognosis is hopeless.

[The writer has referred rather vaguely to that interesting class of cases in which a rapid increase of adipose seems to be directly associated with suspension of the ovarian functions. That this condition is not due to true atrophy is proved by the fact that menstruation may return and even conception occur after the excessive weight has been reduced by rigid diet and

exercise. This intimate relation between the ovarian function and metabolism would seem to furnish an argument in favor of the so-called internal secretion of the ovary.—ED.]

Metrorrhagia in Young Girls.—SIREDY (*Revue prat. d'Obstétrique et de Gynécologie*, 1900, No. 3) calls attention to cases of metrorrhagia in young girls in whom no local cause can be discovered to account for the phenomenon. The writer believes that while heredity may play some part, the natural tendency is aided by overexertion, especially by horseback riding, cycling, dancing, etc., which stimulate the pelvic circulation.

As regards treatment, hot vaginal douches and tampons are rarely necessary, and should not be resorted to except in extreme cases. Prolonged hot rectal irrigation with the double-current tube is a useful means of local treatment. Absolute rest in bed throughout the entire period should be maintained. Long walks, dancing, the use of the bicycle and sewing machine, horseback riding, or long standing must be interdicted, and at other times should be permitted only in moderation.

Careful attention to the general health, regulation of diet, and the overcoming of inherited defects are important adjuvants. Hydrotherapy, especially the cold douche, is a valuable means of diminishing pelvic congestion. Life in the country, with the absence of all exciting social elements, is preferable.

Calcareous Deposit in the Tube.—PESTALOZZA (*La Settimana Medica; La Gynécologie*, February 15, 1900) describes a small, pedunculated growth, the size of a hazelnut, which he found attached to the end of a Fallopian tube. It contained a calcified nodule. The wall of the opposite tube was generally calcified. The writer regards this case as quite rare, in fact as equalled only by one described by Potaillon.

Pneumonia after Gynecological Operations.—ANOUFRIER (*Journ. russe d'Accouch. et d'Obstétrique*, 1899, No. 9) calls attention to the occurrence of streptococcic pneumonia after unclean vaginal operations, especially extirpation of the cancerous uterus. Saprophytes are carried through the lymphatics and bloodvessels to the lungs, where they prepare a favorable culture-medium for streptococci. Septic pneumonia may develop from wounds without suppuration being present, as in a case cited by the author. He urges more vigorous attention to vaginal asepsis, by spending a week in thoroughly cleansing the canal before operation.

Hysteropexy in a Child.—VILLEMIN (*La Gynécologie*, February 15, 1899) reports the case of a girl, aged fourteen years, with complete procidentia of two years' standing, which developed suddenly while she was lifting a heavy weight. The little patient experienced a sudden, severe pain in the lower abdomen, and noticed a protrusion from the vulva. Shame led her to conceal her trouble until a few days before entrance to the hospital, when a second attack of pain followed another effort at lifting. The cervix, which was nearly two inches long, was amputated, and hysteropexy was performed successfully.

OBSTETRICS.

UNDER THE CHARGE OF

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The Treatment of Tumors Complicating Pregnancy.—In the *Medical News*, 1900, p. 1028, WELLS contributes a paper upon this subject. He estimates that two-thirds of the cases of pregnancy complicated by the early stages of cancer go on toward term. In spite of this fact, in view of the feeble vitality of children so born, and of the dangers to the mother which birth brings about, the presence of cancer at any stage of pregnancy demands a radical operation. When the body of the uterus has attained some size, he advocates Werder's method. By this the ovarian and uterine arteries are tied through an abdominal incision, the uterus freed from the bladder and broad ligament, without cutting through the abdominal wall. The vagina is then freed from its adhesions by blunt dissection, and the uterus drawn down and out through the vulva. The peritoneum is then united over the fundus, the abdominal wound is closed, and the operation completed by removing the uterus after dividing the inverted vagina at the point selected. If the uterus is too large, a supravaginal amputation should first be made to lessen its bulk before the removal below of the cervix and vagina.

As regards fibroids complicating pregnancy, the gravest cases are those in which the fibroid occupies the pelvic cavity. Abnormal attachments of the placenta, post-partum and puerperal hemorrhages, and other complications may arise. Myomectomy is justifiable with small subperitoneal tumors of the fundus or any sort of fibroids so situated that they can be removed. With interstitial tumors, supravaginal hysterectomy is the operation of choice. During labor attention should be given to securing contraction of the uterus during the third stage. If post-partum hemorrhage occurs the womb should be explored by the hand, as sometimes fibroids are found that can be easily enucleated, and the womb should then be packed with gauze. Ergot should also be used. Where the tumor is at the fundus, inversion of the uterus may result, which necessitates immediate enucleation and replacement or hysterectomy. When the tumor is in the anterior wall of the womb it may sometimes be pushed out of the way with the patient in the knee-chest position. This cannot happen if the tumor is lateral or posterior. Fibroid polyps should be removed after labor to prevent sloughing.

In ovarian tumors complicating pregnancy the tumor should be removed if detected early in pregnancy. After the fifth month, if the cyst is impacted and not large, the interests of the foetus may be consulted, and operation may be postponed until it is viable. Should, however, impaction or obstruction to labor occur by an ovarian cyst, abdominal section is the better procedure.

The Indications for Premature Delivery with Reference to Eclampsia.—MARX (*Medical News*, 1900, p. 1030) contributes a paper in which he lays special stress upon the toxæmia of pregnancy. He believes that urea is always found greatly diminished in this condition. He makes a strong plea for a methodical course of urea estimation in all cases. He believes that progressive diminution of urea excretion, with or without albuminuria, is the sole indication for the induction of premature labor, which is especially indicated when conscientious medical treatment fails.

As regards the induction of labor for pelvic contraction he believes that the bony pelvis affords an absolute indication in very few cases. He believes that the comparative size of the pelvis with reference to the head is the important matter. If the head fails to engage, it is proof positive that the pelvis is too small for the head or the head too large, and interference must be practised. The pelvimeter is an instrument for comparison and not one of precision.

Gangrene of the Puerperal Uterus.—BECKMANN contributes an interesting and extensive paper upon this subject, with illustrations, in the *Zeitschrift für Geburtshülfe und Gynäkologie*, 1900, Band xlii., Heft 3. In his observation, gangrene of the puerperal uterus is not infrequent. He has found it present in a considerable number of affections of the puerperal uterus, more frequently in private practice than in maternity hospitals, because in the former the frequency of puerperal septic infection is greater.

The diagnosis of this condition is not readily made. There are no definite symptoms which point to this complication. When, however, cases of septic infection are differentiated the diagnosis is not so difficult. The enlargement of the uterus during the first few days of the disease, delayed involution, swelling of the inner surface of the uterine wall, and the expulsion of this tissue are the characteristic phenomena. The temperature curve is that commonly seen in gangrene or pyæmia. The prognosis depends upon the severity of the infection, upon the complications present, and especially upon the presence or absence of perforation of the uterus. The death-rate is stated as 27.5 per cent. Uncomplicated cases usually end in recovery. Whether the uterus resumes its function after the patient's illness depends upon the amount of necrotic tissue and the proportion of uterine surface which is destroyed. The mucous membrane of the womb does not, as a rule, re-form.

Streptococcus infection is the sort usually present in these cases. This spreads through the deeper bloodvessels of the uterus and also through the lymph-vessels, with the formation of thrombi. Necrosis of the connective tissue results, and in severe cases the patient dies before the necrotic tissue can separate. Usually, however, dead tissue comes away with the free formation of pus. In three cases saprophytes were found, although it cannot be definitely known whether the ordinary bacteria of putrefaction are instrumental in producing this condition.

In the treatment 52 per cent. of the cases were subjected to some sort of operative treatment. In some this was instrumental delivery after a prolonged labor. In other cases typhoid infection had preceded the patient's labor. In portions of the uterine tissue which did not become gangrenous degeneration of the muscle-fibre was observed.

In selecting treatment for these cases attention is called to the danger of douching or curetting the uterus.

[In treating such cases the drainage of the womb must be properly secured. If the uterus is retroverted it should be replaced and held in position by a packing of antiseptic gauze. This must be frequently changed and the vagina gently but thoroughly irrigated. The patient's general condition requires very careful and persistent stimulation.—ED.]

Puerperal Eclampsia Treated by Hypodermoclysis, with Diuretic Infusions.—Appreciating the difficulty of securing prompt secretion of urine in eclamptic cases, JARDINE has for three years employed saline infusions consisting of sodium chloride and potassium bicarbonate or sodium acetate (*British Medical Journal*, 1900, p. 1279). The writer controls the fits by using chloroform, veratrum viride, or chloral and bromide; he usually prefers veratrum viride. Whenever possible he administers magnesium sulphate by the mouth, using four to six tablespoonfuls in warm water. If the patient cannot swallow it is given through a tube. Chloral and bromide are given with it in many cases. A hot pack is also employed.

He places, however, the greatest reliance upon introducing a solution of one drachm each of potassium bicarbonate and sodium chloride to two pints of boiled water. From one to three pints will be absorbed at a time. The temperature of the water should be 104° F., and antiseptic precautions should be employed with the needle and in cleansing the skin. The needle is usually introduced beneath the breast. No special apparatus is required, a sterile trocar and canula, tubing, and a funnel being all that is needed. In 200 infusions no case of abscess has occurred.

[We have also employed this method for some time, with the best results. A more prompt and efficient method of using the same agents is found in intravenous transfusion. Added to this we may often practice to advantage copious injections of magnesium sulphate into the intestines, passing a rectal tube as high as possible and using as much fluid as can possibly be retained. We have seen very prompt diuresis follow this method of treatment.]

The Frequency and Significance of Infarcts of the Placenta.—In the recent anniversary publication dedicated by his pupils to Professor Welch, WILLIAMS contributes a paper under the above title.

He has examined 500 placentæ to determine the significance of infarcts, and illustrates his paper by a reproduction of microscopical sections. He concludes that infarcts measuring at least 1 cm. in diameter were observed in 63 per cent. of his cases. The great majority of placentæ have small infarcts just visible to the naked eye, while microscopical examination shows early stages of infarct formation in all full-term placentæ. Endarteritis of the vessels of the chorionic villi is the cause of these infarcts. This results in coagulation necrosis in the villi just beneath the syncytium, with subsequent formation of canalized fibrin. The syncytium also degenerates, and is similarly converted, and blood coagulates beneath the villi, matting together groups of villi by masses of fibrin. Later the stroma of the villi degenerates and the infarct becomes a network of fibrin. In many cases this arises from the foetal ectoderm rather than from the decidua. Moderate

degrees of this process are not pathological, and have no influence upon the mother or child, but denote senility of the placenta. Marked formation of infarcts often results in death or imperfect development of the foetus. It is usually associated with albuminuria on the part of the mother. Why, we cannot say. In cases of eclampsia infarct formation is not especially noticeable, but is usually observed only in those cases which were preceded by albuminuric symptoms. There is no evidence that bacteria had anything to do with this process.

DERMATOLOGY.

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Urticaria—PHILIPPSON (*Giorn. Ital. delle Mal Ven. e delle Pelle*, 1899, Fasc. v.; *British Journal of Dermatology*, June, 1900) opposes the current opinion held by most dermatologists, that urticaria is due to reflex nervous action exerted on the bloodvessels; he believes with Haidenhain that a secretory action of the vascular endothelium is involved, and that the oedema which occurs in this disease is similarly produced by direct action of poisonous substances upon the vessels in the neighborhood. He concludes that, just as in the case of erythema, urticaria is a mild inflammation in which the irritant is of low intensity and exerts a more purely local action.

Dermatitis Venenata due to the Common Ivy.—W. J. MUNRO (*Australasian Medical Gazette*, January 20, 1900) reports a case in which an inflammation of the erythemato-vesicular type was set up in a woman, aged forty years, by contact with the wet leaves of the common ivy (*Hedera helix*). In all four distinct attacks were observed, each attack indicating an increased susceptibility to the poison. The lesions were grouped here and there, and bore a resemblance to herpes zoster.

Mycosis Fungoides.—GALLOWAY and MACLEOD (*British Journal of Dermatology*, May and June, 1900) describe three cases and give the following summary of the histological description: In the lesions of the prefungoid stage there exists a connective tissue cell proliferation around the bloodvessels of the subpapillary and papillary layers, the hair follicles, sebaceous glands, coil ducts and occasionally the coil glands, and forming foci independent of these structures situated among the connective tissue bundles. In the epidermis active mitosis of the prickle cells and downgrowth of the interepithelial processes is noted; also nests of corium tissue in the mucous layer,

and interepithelial œdema going on to the formation of reticular spaces. In the tumor stage the cell proliferation increases, and the cells show a marked tendency to break down, as evidenced by the crenation, irregularity, and fragmentation of the cells. The granuloma encroaches on the downgrowing epithelium, flattens it out, spreads up to the surface, and is covered only by a layer of the stratum corneum.

The diseases with which mycosis fungoides has been confused histologically are the granulomata of tubercle and syphilis, the sarcomata, and the leukæmic and pseudoleukæmic growths of the skin. It resembles syphilis in many particulars. In contradistinction to tuberculosis of the skin, giant cells with central caseous degeneration do not occur in mycosis fungoides. In the skin lesions of leukæmia there is great œdema affecting the vessels of the cutis, and active diapedesis from them, and an infiltration of the neighboring cutis with leucocytes; it is purely a leucocytic infiltration without marked fixed-cell proliferation, mitosis, or imperfect giant-cell formation, such as occurs in mycosis fungoides. Pseudoleukæmia cutis is more like a syphilitic granuloma than mycosis fungoides. The bacteriological examination was negative.

An Epidemic of Impetigo Contagiosa.—OHMANN-DUMESNIL (*St. Louis Medical and Surgical Journal*, June, 1900) reports thirteen cases that were traced from one individual to another, thus showing contagion. With one exception all occurred in infants or children. The cases were observed for the most part in several families. Antiseptic ointments of camphor and carbolic acid were successfully employed. The author calls attention to the point that the diagnosis should be made early, and treatment instituted before opportunity for spreading has been given.

Pemphigus of the New-born.—BLOCH (*Archiv. für Kinderheilk.*, vol. xxviii., 1900) distinguishes a benign and a malignant form, the latter resembling foliaceous pemphigus and also Ritter's exfoliative dermatitis, and are nearly always fatal. It represents a generalized infection, due in most cases to streptococci, the mode of infection being not always clear. It is contagious, and is often spread by the midwife. The article is based on twenty cases, studied clinically, anatomically, and bacteriologically.

Gelatin Applications.—HERBERT SKINNER (*Brit. Journ. of Derm.*, May, 1900) experimented with gelatin and agar-agar, but the latter was not found useful for the purpose. Gelatin is more tractable, but any formula given will depend on the gelatin used, no two samples seeming alike, while half an hour's treating will make two samples from the same lot behave differently.

A Cream of Carbonate of Zinc.—HERBERT SKINNER (*Brit. Journ. of Derm.*, May, 1900) prefers carbonate of zinc to commercial calamine, which is often impure and far from desirable as an application to an inflamed surface. The carbonate of zinc compounded as follows makes a useful so-called cream. R. Glycerin amyli, adeps. lanæ. hydros., zinci carb., glycerin, of each ʒss. The first two are mixed together, then the second two, finally both together. The zinc may be increased or decreased.

PATHOLOGY AND BACTERIOLOGY.

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Elastic Tissue in the Uterus and Ovary.—WOLTKE (*Ziegler's Beiträge*, 1900, vol. xxvii., p. 575), in the investigation of the elastic tissue of the uterus, examined twenty cases ranging from four months to eighty-six years in age. Sections were cut in such a way as to include both serosa and mucosa, and were stained first by Weigert's method, then washed in 96 per cent. alcohol, and placed for a few seconds in a mixture of 1 to 2 per cent. fuchsin solution and a 10 per cent. aqueous solution of picric acid.

There are three muscle layers in the uterus. The outer and inner consist of muscle bundles running longitudinally; the middle layer shows a circular arrangement, and is the thickest. The outer and inner layers are known as the stratum subserosum and stratum submucosum, the middle as the stratum vasculosum. Only in the interstitial tissue of the outer and middle layers of the corpus and fundus uteri are elastic fibres invariably found.

In the middle layer the fibres fail gradually as they run inward, so that they are lacking in the inner layer. They are most numerous in the outer layer, where they surround the muscle bundles and send fine processes in among the muscle fibres. Elastic tissue separates the muscle bundles of the outer layer from the connective tissue serosa, also the subserosa from the serosa of the peritoneum. This condition holds from the age of four months to the climacteric.

After the age of seventy years two changes appear. The elastic fibres in the middle layer form bunches around the bloodvessels, which group themselves together and show signs of sclerosis, and the number of elastic fibres in this layer decreases. These changes are especially marked in senile atrophy at from eighty-three to eighty-six years.

In youth the number of elastic fibres depends on the sexual life. If conception has taken place the number is much increased; in a virgin uterus the number is small. In young people the elastic fibres in the muscularis are thin and delicate; with increasing age they become thicker, and after fifty or sixty years they present a bunched and crumpled appearance. At a still greater age the fibres run together in clumps. The arrangement of fibres about the openings of the tubes is the same as in the body and fundus.

In the portio vaginalis the elastic fibres form a network just under the stratified epithelium, reaching to the mucosa of the cervix. A more deeply lying network surrounds the vessels, and is connected with the superficial layer by slender processes which fail toward the mucosa of the cervix. After seventy years the deeper network disappears.

In inflammation, with hyperplasia of the connective tissue, there is an increase in the elastic fibres. In fresh catarrhal inflammation of the vagina the round cells force themselves between the stratified epithelium and the superficial elastic network, pushing the latter away, and they may even break through the network. If the inflammation becomes chronic, elastic fibres appear in the newly forming fibrous tissue.

In a three-months' pregnant uterus, with the ordinary hyperplasia of the uterine tissue, the elastic fibres increase only in the layers in which they are normally found; they preserve their physiological limits.

In proliferation of the intima of the vessels of the stratum vasculosum large numbers of delicate elastic fibres appear, and the elastica is somewhat thickened. Elastic tissue disappears toward the decidua, and in the spongy layer the bloodvessels have no elastica. In the vaginal portion the elastic tissue is much more abundant in the pregnant than in the virgin uterus. In a word, in the first half of pregnancy the increase in elastic fibres follows the increase in bloodvessels.

In a seven-months' pregnant uterus the elastic fibres are few in number, having rapidly diminished since the third month. The elastic tissue increases with the hyperplasia of the uterus during the first half of pregnancy, and during the last half, as the uterine walls become thinner, the elastic tissue disappears. The vagina shows the same phenomenon, but in the paracervical tissue the elastic fibres are extremely numerous.

In the chorionic villi and septa of the placenta no elastic fibres have been seen.

Examination of the puerperal uterus showed that the elastic fibres regenerate rapidly. As new muscle fibres appear the elastic tissue also regenerates, and delicate fibres can be seen surrounding the muscle bundles and sending processes between the muscle fibres.

The cortical substance of the ovary contains no elastic tissue, but among the vessels and nerves of the hilus elastic tissue is richly developed. In the medullary substance the amount depends on age and on physiological function. In a nineteen-year-old virgin elastin appears only in the vessel walls, but in a primipara of twenty-three years elastic tissue appeared in the medullary substance near the follicles. In youth the fibres surround part of the obliterated follicle, in middle age the whole, and in old age the fibres are thickened and bunched.

In a primipara of twenty-five years it was observed that in the connective tissue which replaced the Graafian follicles the ground substance consisted of innumerable elastic fibres, which formed a delicate network. On the other hand, in another similar ovary no elastic fibres could be demonstrated. However, in most cases elastic tissue can be made out, and it seems to arise from the proliferating ovarian stroma. Up to a certain age the corpora fibrosa increase in number, and about them there is an increase in elastic tissue.

The elastic tissue of the ovarian bloodvessels undergoes changes chiefly in arterio-sclerosis. The elastic fibres in the intima increase in number, and the elastica interna often divides into two layers. If calcification also occurs the media contains little or no elastic tissue. In this case the increase of the fibres in the intima may be considered as a compensatory change to maintain the elasticity of the vessels.

The lumina of the vessels in the medullary substance often become obliterated by the proliferation of cells which adhere to the degenerated walls. The material of the degenerated walls can be seen to consist of thick elastic fibres which have become somewhat hyaline.

In the neighborhood of the corpora fibrosa are bloodvessels which have evidently been obliterated for some time. This is due to newly formed connective tissue which contains much elastic tissue.

Squamous-celled Carcinomatous Degeneration of an Ovarian Dermoid Cyst.—PETERS (*Bulletin of the Johns Hopkins Hospital*, 1900, vol. xi., p 78) gives a detailed description of a specimen in which an epidermoid carcinoma originated in a dermoid cyst of the ovary. Physical examination of the patient did not reveal carcinoma in any other part of the body. The tumor invaded the wall of the cyst and the surrounding tissues. A transition from the lining epithelium of the cyst into the epithelioid cells of the carcinoma was demonstrated. Some of the tumor cells were multinuclear, and their appearance suggested direct division. Giant cells similar to those often met with on the inner surface of dermoid cysts, free from any malignant new-growth, were present. These have been described by Hildebrandt as foreign-body giant cells due to the presence of hairs in the walls of the cysts. Peters, however, has often observed them in parts of the walls of dermoid cysts in which there were no hairs to be seen, and also in simple dermoids in which no hairs were found in any part of the tumor. He believes, with Cullen, that they are more probably a form of embryonic epithelium from which the lining epithelium of the cysts is developed.

A detailed description of the specimen and the clinical and post-operative history of the patient are given.

In reviewing the literature Peters finds that as yet no case of carcinoma thought to be derived from the coil or sebaceous glands of a dermoid cyst has been reported.

Among secondary changes, other than carcinomatous, which have been observed in dermoid cysts, he notes degeneration of glands in the wall of a dermoid and the development of sarcoma and of endothelioma. He reports also a case of carcinomatous degeneration of a part of an ovary in another part of which was a dermoid cyst.

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A REPORT OF CASES OF PERNICIOUS ANÆMIA, WITH SPECIAL
REFERENCE TO THE BLOOD-FINDINGS.¹

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IN the twenty cases herewith reported the diagnosis of pernicious anæmia was based upon the clinical history and the physical findings, but most of all upon the blood condition. The individual histories, briefly given, show in most of the cases the absence of morbid physical findings except those due to anæmia. The important anatomical changes recognized clinically are noted in the general conclusions.

The high color index, the severe degree of poikilocytosis, the constant presence of polychromatophilia, and the presence of megaloblasts, usually predominating, at some period of the observation, over the normoblasts, were considered pathognomonic of the disease.

In five of the cases but one personal examination of the blood was made. The history of these cases and the blood condition were so characteristic that it seems proper to report them as pernicious anæmia. In all the remaining cases a sufficient number of observations were made and the cases were studied over a sufficiently long period of time to make the diagnosis certain. Six of the cases were observed and studied over a period of from five months to one year. In most of these cases blood examinations were made every month.

The clinical course was found to be that usually observed. Periods of improvement occurred, followed by periods of decline. During these periods the blood condition was materially altered. Charts of the blood condition showing the color index, the number of red and white cells, the percentage of hæmoglobin and the number of nucleated red cells per c.m. of Cases X., XI., XIII., XIV., and XV., during periods of improvement and decline, show more graphically than words the varying condition of the blood.

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May, 1900.

Case No.	Date.	Hæmoglobin.	Specific gravity.	Reds.	Color index.	Whites.	Small mono-nuclear.	Large mono-nuclear.	Polymorpho-nuclear neutrophile.	Eosinophile.	Myelocytes.	Nucleated reds in 1 c.mm.					Polkilocytosis.	Polychromatism.	Remarks.
												Normo-blasts.	Micro-blasts.	Megalo-blasts.	Total.	Irregu-larity of nucleus.			
I.	1899 Mar. 18	24	.....	1,400,000	0.94	21,000	6.2	2.8	90.7	0.8	0.0	84	0	84	168	+	+	+	Died Mar. 20, 1899.
	Aug. 31	34	.....	1,010,000	1.85	6,000	38.0	1.4	60.0	0.4	0.2	39	0	189	228	+	+	+	Died Sept., 1899.
II.	Aug. 27	37	1089	488,000	4.16	6,000	32.4	8.4	52.0	0.4	6.8	144	360	1224	1704	+	+	+	
	Sept. 6	34	1036	580,000	3.52	9,000	38.4	5.6	44.8	0.8	10.4	1456	1332	2700	5420	+	+	+	
IV.	Sept. 17	26	1031	560,000	2.55	34,000	25.9	10.1	34.2	0.4	29.4	1768	1496	7092	10836	+	+	+	Died Sept. 22, 1899.
V.	Sept. 5	34	1039	1,436,000	1.30	4,500	28.8	0.8	68.0	1.6	0.8	18	7	54	72	+	+	+	
VI.	July 29	25	.....	848,000	1.62	3,500	27.0	2.0	68.0	3.0	0.0	7	0	7	21	+	+	+	Great improvem't.
	Aug. 14	48	1046	1,624,000	1.63	6,000	21.0	3.0	71.6	4.0	0.4	12	0	0	12	0	+	+	Improvement.
VII.	May 10	21	.....	828,000	1.39	6,000	.....	.....	.....	.....	.....	+	.....	+	.....	..	+	+
	Sept. 27	55	.....	2,080,000	1.26	7,600	.....	.....	.....	.....	+	+	.....	+	.....	..	+	+
VIII.	Oct. 30	40	.....	1,912,000	1.15	2,000	27.0	2.0	71.0	1.0	0.0	2	0	2	4	+	+	+	
	Oct. 20	18	1032	679,000	1.45	2,000	28.0	1.0	69.0	1.0	1.0	45	0	270	315	+	+	+	Died Nov., 1899.
IX.	Nov. 8	20	1033	540,000	2.08	3,500	33.2	2.4	62.4	0.8	1.2	30	14	84	128	+	+	+	
	Dec. 11	17	1028	760,000	1.23	9,000	27.0	0.6	71.2	1.2	0.0	54	0	81	135	+	+	+	Died Jan., 1900.
X.	Dec. 29	20	1028	880,000	1.25	2,000	13.6	2.9	83.2	0.8	0.4	6	0	9	15	+	+	+	Died Nov., 1899.
	Sept. 27	21	1029	864,000	1.22	6,000	38.0	1.4	60.0	0.4	0.2	8	0	8	16	+	+	+	
	May 9	38	.....	2,000,000	0.91	.....	.....	.....	.....	.....	.....	44	0	4	48	+	+	+	
	July 25	28	1029	900,000	1.7	4,000	48.0	3.0	48.0	1.0	0	24	0	16	40	+	+	+	
	Aug. 9	21	1029	1,110,000	1.04	4,000	52.0	1.2	46.8	0.0	0	20	0	80	100	+	+	+	
	Sept. 6	27	1031	1,008,000	1.47	5,000	60.8	1.2	37.2	0.8	0	0	0	0	0	0	+	+	
	Sept. 30	30	1033	1,300,000	1.27	1,500	49.2	2.4	48.0	0.0	0	0	0	0	0	0	+	+	
	Oct. 14	28	1032	1,118,000	1.88	3,000	48.5	0.5	55.0	0.5	0.5	0	0	0	0	0	+	+	Improvement.
	Nov. 5	38	1038	1,620,000	1.29	2,000	46.5	1.0	52.0	0.0	0.5	10	0	0	10	0	+	+	
	Dec. 5	42	1042	2,240,000	1.03	2,000	42.0	2.0	55.0	1.0	0	0	0	0	0	0	+	+	
	1800 Jan. 7	49	1047	2,312,000	1.16	4,000	45.0	2.0	51.0	2.0	0	1	0	3	4	sl	+	+	
	Feb. 5	62	1051	2,550,000	1.83	6,000	40.0	1.0	58.0	1.0	0	0	0	0	0	sl	+	+	
	Mar. 8	65	1053	3,200,000	1.12	6,000	34.4	4.8	60.8	0.8	0	0	0	0	0	sl	+	+	
	April 6	74	1058	4,010,000	1.01	6,500	36.5	6.0	56.5	1.0	0	0	0	0	0	sl	+	+	
	May 5	76	1060	4,146,000	0.99	7,000	40.0	2.0	57.0	1.0	0	0	0	0	0	sl	+	+	
	June 2	80	1060	4,210,000	1.04	6,200	37.0	6.0	56.0	1.0	0	0	0	0	0	sl	+	+	
XI.	1898 Dec. 29	45	.....	2,228,000	1.11	3,500	28.0	5.0	69.0	2.0	1	70	0	0	70	..	+	+	Improvement.
	1899 Feb. 14	58	.....	2,988,000	1.07	4,600	22.0	6.0	67.0	5.0	0	55	0	0	55	..	+	+	
	April 28	65	.....	3,276,000	1.09	7,200	23.0	8.0	66.0	3.0	0	0	0	0	0	0	+	+	
	July 31	23	1033	3,886,000	1.43	3,500	80.4	4.0	63.1	2.0	0.5	70	14	808	892	+	+	+	Decline.

XII.	1899	Aug. 2	1033	1,044,000	1.21	4,000	28.0	.....	3.0	.....	66.0	2.5	.....	60	.....	20	.....	940	.....	420	.....	...	+	+	+	...	Died Aug 15, 1899.
		Aug. 5	1033	944,000	1.3	4,500	17.2	.....	0.4	.....	78.8	3.0	.....	85	.....	19	.....	800	.....	335	.....	+	+	+	+	...
		Aug. 11	1030	720,000	1.42	4,750	29.0	.....	0.5	.....	68.0	2.0	.....	16	.....	0	.....	24	.....	40	.....	+	+	+	+	...
		Oct. 24	1035	2,100,000	0.84	8,000	17.5	.....	5.5	.....	72.0	5.0	.....	5	.....	0	.....	10	.....	15	.....	+	+	+	+	...
		Nov. 10	1037	2,020,000	1.00	3,000	24.5	.....	2.0	.....	67.5	0.5	.....	0	.....	0	.....	4	.....	8	.....	+	+	+	+	...	Improvement.
XIII.		Dec. 6	1047	2,348,000	1.12	9,000	54.8	.....	1.6	.....	43.6	0.0	.....	12	.....	12	.....	12	.....	36	.....	+	+	+	+	...	Improvement.
		Sept. 8	1034	960,000	1.4	3,000	49.8	.....	0.8	.....	47.8	1.6	.....	0	.....	24	.....	32	.....	72	.....	+	+	+	+	...	"
		Sept. 23	1038	1,968,000	0.98	2,000	39.5	.....	1.5	.....	55.5	0	.....	2	.....	0	.....	0	.....	2	.....	+	+	+	+	...	"
		Oct. 20	1045	3,060,000	0.77	2,000	30.0	.....	6.0	.....	57.0	7.0	.....	0	.....	0	.....	3	.....	8	.....	+	+	+	+	...	"
		Nov. 26	1045	2,736,000	0.88	1,500	44.0	.....	8.0	.....	45.0	3.0	.....	0	.....	0	.....	0	.....	0	.....	+	+	+	+	...	"
XIV.		Dec. 29	1046	2,760,000	1.0	2,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+	+	+	+	...	"
		1900																				+	+	+	+	...	"
		Feb. 11	1052	3,250,000	1.1	4,000	35.0	.....	5.0	.....	55.5	4.0	.....	0	.....	0	.....	0	.....	0	.....	+	+	+	+	...	"
		Mar. 21	1054	3,720,000	1.07	6,000	80.0	.....	6.0	.....	56.0	7.0	.....	0	.....	0	.....	0	.....	0	.....	+	+	+	+	...	"
		May 2	.....	4,140,000	0.99	6,500	32.0	.....	4.0	.....	59.0	5.0	.....	2	.....	0	.....	0	.....	0	.....	+	+	sl	+	...	"
XV.		1899																				+	+	+	+	...	Improvement.
		Nov. 3	1031	744,000	1.62	1,000	57.0	.....	4.5	.....	38.5	0.0	.....	25	.....	5	.....	85	.....	115	.....	+	+	+	+	...
		Nov. 10	1031	810,000	1.49	1,500	60.0	.....	2.0	.....	33.0	4.5	.....	15	.....	0	.....	81	.....	96	.....	+	+	+	+	...
		Nov. 17	1033	920,000	1.20	2,000	41.5	.....	5.0	.....	46.5	7.0	.....	10	.....	20	.....	60	.....	90	.....	+	+	+	+	...
		Dec. 7	1046	2,536,000	0.95	3,000	42.0	.....	3.0	.....	44.0	10.0	.....	0	.....	0	.....	0	.....	0	.....	+	+	+	+	...	Improvement.
XVI.		1900																				+	+	+	+	...	"
		Jan. 1	1048	2,800,000	1.08	8,500	16.0	.....	2.6	.....	76.0	5.0	.....	19	.....	0	.....	51	.....	70	.....	+	+	+	+	...	"
		Jan. 18	1052	2,650,000	1.23	6,000	20.0	.....	7.0	.....	65.0	8.0	.....	12	.....	0	.....	12	.....	24	.....	+	+	+	+	...	"
		Feb. 23	1050	2,400,000	1.23	4,000	32.0	.....	4.0	.....	60.5	8.5	.....	4	.....	4	.....	32	.....	40	.....	+	+	+	+	...	"
		Apr. 10	.....	1,132,000	0.97	3,500	46.8	.....	0.8	.....	49.0	0.8	.....	14	.....	0	.....	102	.....	116	.....	+	+	+	+	...	Decline.
XVII.		May 8	1032	630,000	1.74	1,200	51.0	.....	1.0	.....	46.0	1.0	.....	12	.....	0	.....	36	.....	48	.....	+	+	+	+	...	"
		1899																				+	+	+	+	...	
		May 20	1037	726,000	2.4	5,000	21.8	.....	5.0	.....	73.0	1.0	.....	10	.....	0	.....	20	.....	30	.....	+	+	+	+	...	Improvement.
		Sept. 16	1051	3,500,000	0.94	7,000	20.0	.....	0.8	.....	76.4	2.8	.....	0	.....	0	.....	0	.....	0	.....	+	sl	+	+	...	Decline.
		Oct. 11	1048	2,088,000	1.32	5,000	29.0	.....	0.5	.....	70.0	1.5	.....	0	.....	0	.....	0	.....	0	.....	+	+	+	+	...	"
XVIII.		Dec. 9	1034	1,160,000	1.23	1,500	35.2	.....	2.0	.....	60.0	2.0	.....	6	.....	0	.....	36	.....	42	.....	+	+	+	+	...	"
		Dec. 18	1033	830,000	1.40	2,000	25.0	.....	1.0	.....	70.0	1.0	.....	4	.....	0	.....	28	.....	32	.....	+	+	+	+	...	"
		1900																				+	+	+	+	...	Improvement
		Jan. 2	1039	1,868,000	1.10	8,000	30.5	.....	2.0	.....	65.0	2.0	.....	30	.....	0	.....	45	.....	75	.....	+	+	+	+	...	"
		Feb. 6	1051	2,560,000	1.07	4,500	39.0	.....	1.0	.....	56.0	1.0	.....	90	.....	0	.....	180	.....	270	.....	+	+	+	+	...	Decline.
XIX.		Mar. 11	1043	2,240,000	1.10	8,000	20.8	.....	2.8	.....	74.0	2.8	.....	12	.....	0	.....	36	.....	48	.....	+	+	+	+	...	Died May 21, 1900.
		Apr. 17	1036	1,568,000	1.6	3,500	40.0	.....	2.0	.....	56.0	0.0	.....	0	.....	0	.....	70	.....	70	.....	+	+	+	+	...
		Jan. 19	.....	912,000	0.91	7,200	8.0	.....	12.6	.....	79.0	0.1	.....	7	.....	0	.....	14	.....	21	.....	+	+	+	+	...
		June 16	.....	1,762,000	0.6	7,000	7.4	.....	4.4	.....	87.7	0.5	.....	7	.....	0	.....	14	.....	21	.....	+	+	+	+	...	Died April 6, 1900.
		Mar. 28	.....	701,200	1.57	4,140	44.8	.....	3.8	.....	50.0	1.0	.....	8	.....	0	.....	24	.....	32	.....	+	+	+	+	...
XX.		Apr. 4	.....	1,674,000?	0.66	1,140	26.5	.....	3.0	.....	69.0	1.0	.....	1	.....	0	.....	4	.....	5	.....	+	+	+	+	...	Died June 16, 1900.
		Apr. 13	.....	156,000	8.9	5,996	39.8	.....	1.6	.....	57.0	1.4	.....	2	.....	0	.....	24	.....	26	.....	+	+	+	+	...
		June 9	.....	996,000	1.7	3,330	42.0	.....	3.5	.....	53.0	1.5	.....	0	.....	0	.....	10	.....	10	.....	+	+	+	+	...
		June 1	.....	756,000	2.0	3,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+	+	+	+	...
		June 15	1035	980,000	1.46	8,000	18.0	.....	0.8	.....	78.4	2.0	.....	82	.....	128	.....	400	.....	660	.....	+	+	+	+	...

Chart VI. (p. 519) shows a differentiation of the white cells in Case XV. It will be noted that in most of the cases the white count is decreased and the number present corresponds somewhat with the rise and fall of the red cells and percentage of hæmoglobin. It will also be noted that the decrease in leucocytes is due to an absolute decrease in the polymorphonuclear forms.

The accompanying table of the blood counts, including the differentiation of the white cells, the enumeration of the nucleated red cells, the presence or absence of degeneration of the nucleus of the megaloblast (classed as irregularity of the nucleus), the presence or absence of poikilocytosis and polychromatophilia (+ = marked ++ = very marked, +++ = extremely marked) is self-explanatory. In the table and charts the percentage of hæmoglobin is based upon the estimation made with the Fleischl instrument, and the actual reading is given uncorrected. The Thoma-Zeiss instrument was used for all blood counts.

Of the twenty cases ten have died. Upon two only was it possible to obtain an autopsy. In both the post-mortem findings were typical of the disease. As nothing unusual was found, I shall not take space to describe the morbid anatomy.

In the other eight cases autopsy was not made because of objections made by relatives or because the patient was at some distance in the country and inaccessible to the writer at time of death.

CASE I.—Male, aged sixty-two years, admitted to the Cook County Hospital, March 18, 1899. Laborer, suffering from great weakness, prostration, and profound anæmia. Physical examination revealed general arterio-sclerosis, emphysema pulmonum, with dilatation of both sides of the heart.

Blood examination showed 1,400,000 reds, 24 per cent. hæmoglobin, and 21,000 white cells. There were present marked poikilocytosis, polychromatophilia, and a total of 168 nucleated red cells per cubic millimetre, of which 84 were megaloblasts. The patient died on March 20. No autopsy was obtainable.

The physical findings in this patient were senile in character, and there was nothing to account for the condition of the blood in the physical findings.

In this case the color index was below normal. The leucocytosis was probably of the terminal form, as the patient died two days later. This accounts for the excess of the polymorphonuclear neutrophiles which were present. The megaloblasts were typical and showed much irregularity of the nucleus.

CASE II.—Female, aged thirty-four years, married, American, and has borne one child. Was seen first in May, 1898. She gave a history of illness of about one year's duration. She was pale, complained of want of strength and endurance. Blood examination revealed 2,800,000 red cells and 40 per cent. of hæmoglobin. There were no nucleated red cells found, and the white count showed 8000 per cubic millimetre. The spleen was palpable. There was a slight eczema-like eruption in

both axillæ and about the pubic region. The urine was of light weight, but contained no abnormal ingredients.

The physical findings were negative excepting those named. The patient improved upon restorative treatment of arsenic and iron. In the fall of 1898 she complained of weakness of the lower extremities associated with paræsthesia. There was tenderness upon pressure over the anterior crural nerve and over the musculo-cutaneous branch of the external popliteal. The knee-jerk was diminished. The patient had good control of the bladder and the bowels. The anæmia was still present and practically of the same grade as at the first examination. The patient was not seen again until August, 1899, when she presented evidences of paraplegia associated with paræsthesia of the skin of the lower extremities, diminution of tactile, temperature, and pain sense, a partial loss of control of the bladder, marked ataxia, and inco-ordination. The knee-jerk was entirely lost. The Argyll-Robertson pupil was not present. The fundi were normal. The pulse was rapid, 90 to 100 per minute, and the temperature subfebrile, usually normal in the morning, but from 99° to 100° in the evening. From the middle of August the patient grew worse, with rapidly diminished power in the lower extremities until complete paralysis resulted, with loss of control of both the bladder and the bowels. Tympanites was constant; the anæmia increased, and on August 31 a blood count showed 34 per cent. of hæmoglobin, 1,010,000 red cells, 6000 whites, with 228 nucleated cells per cubic millimetre, of which 189 were megaloblasts. Poikilocytosis was marked, and polychromatophilia present. The paralysis extended upward, involving successively the segments of the cord, with corresponding nerves, and the patient finally died on September 7, 1899, from involvement of the respiratory and cardiac centres.

This patient at the beginning showed anæmia which did not present the characteristics of a pernicious anæmia, either in the color index or in the presence of nucleated or irregular-sized and formed cells. Later the spinal cord symptoms predominated, and, although the anæmia was observed and was considered important, it was not looked upon as a pernicious type until the final examination, eight days before death. The character of the blood at this time was so characteristic of pernicious anæmia that one is forced to look upon the case as primarily a pernicious anæmia with the spinal cord lesion as one of the not unusual accompaniments of the disease. An autopsy was unobtainable.

The blood findings in this case were typical of pernicious anæmia. The megaloblasts were nearly all polychromatophilic, in addition to having an irregularly-shaped and sometimes palely staining nucleus.

CASE III.—Male, aged twenty-four years, seen first on August 27, 1899, with Dr. H. B. Favill. The patient first felt unwell in June of 1899. He was losing strength, and his endurance lessened. He had charge of the finances of a rather large estate and had much responsibility. Without medical advice, he took a rest in the country during the latter part of June and the first half of July. He did not improve, and returned to Chicago. He noticed that he was very pale, breathless upon exertion, and that he was daily growing weaker. He had no pain, and no disturbance of any kind excepting a sense of weakness and languor.

The physical findings were negative, excepting a rather rapid pulse, which was weak, and the temperature ranged from normal in the morning to 100° or 101° in the evening.

A blood examination made on August 27 showed hæmoglobin 37 per cent., with 488,000 reds per cubic millimetre, with a very high color index of 4.16; 6000 white cells, and 1704 nucleated cells per cubic millimetre, of which 1224 were megaloblasts. There was marked poikilocytosis, and polychromatophilia was also present.

On September 17 a final blood count was made which gave 26 per cent. of hæmoglobin, 560,000 red cells per cubic millimetre, with the enormous number of 10,336 nucleated red cells per cubic millimetre, of which 7092 were megaloblasts. There was marked irregularity of the nucleus, especially in the megaloblasts, with increased poikilocytosis and notable polychromatophilia.

During the last week of the patient's life his temperature rose to 104° in the afternoon of each day, with the pulse rapid and weak, and with symptoms of profound weakness, much dyspnoea, and dizziness. There was looseness of the bowels during the entire course, and in the stools were found many infusoria, but no organism which could account for the anæmia. The patient died on September 22. An autopsy was not obtained.

This case was remarkable as showing a very low red count, with an unusually high color index, which is explained by the very large number of macrocytes present. It is noteworthy that during the period in which he was observed the red corpuscles were practically stationary in number, while the hæmoglobin continued to fall. The leucocytes steadily increased with approaching death, and a few days before death there was an inundation of leucocytes, myelocytes, and nucleated red corpuscles, the degenerative megaloblasts predominating. The stained specimen gives findings similar to those of splenic myelogenous leukæmia, but the paucity of red corpuscles and hæmoglobin, the high color index, and the comparatively low white count, as well as the extreme poikilocytosis and polychromatophilia conclusively settled the diagnosis. The number of nucleated red corpuscles was enormous, with many of the nuclei fragmented.

CASE IV.—Female, aged forty three years. Seen with Dr. McInnes, of Belvidere, Illinois, September 5, 1899. Has borne three children. The patient has had chronic diarrhoea for three years with loose, watery movements on rising, and occasionally one or more later in the day, uninfluenced by diet. For several months she has had progressive weakness and fatigue, associated with pallor. The skin has become yellow recently. There was slight swelling of the feet at night; nose-bleed slight on two or three occasions. There was palpitation of the heart. Patient had a desire for sour things; some eructation of gas, but has not vomited; was nervous. There was no blurring of vision. Weighed two years ago 135 pounds, now 107 pounds. Examination showed a systolic murmur at the apex transmitted into the axilla. No accentuation of the second pulmonic sound. A murmur, systolic in time, was heard in the aortic area. No venous hum in the neck. The spleen was palpable.

The patient was pale, and the skin had a yellowish hue. The urine showed a slight trace of albumin, with a little pus. No tubercle bacilli in the urinary sediment. Feces, greenish and watery in color, showed

no parasites. The blood showed hæmoglobin, 36 per cent.; red cells, 1,436,000; white cells, 4000, with poikilocytosis, and 72 nucleated cells per cubic millimetre, of which 54 were megaloblasts. There was irregularity of the nucleus of some cells, with poikilocytosis and polychromatophilia.

The patient improved upon restorative tonics of iron and arsenic, and the diarrhoea ceased with colonic flushings; during the winter of 1899 and 1900 the patient improved and was considered well for two or three months. Her physician reported in March, 1900, that she had again become very anæmic, with all the characteristics observed when first examined, and that she was then confined to bed. No further examination of the blood has been made.

CASE V.—Female, aged fifty-six years, admitted to the Cook County Hospital, July, 1899. Seamstress, who gave a history of illness of about one year's duration. She was very pale; skin yellowish, and presented no physical findings of organic disease. There was a basic murmur, systolic in time, transmitted into the neck, but no venous hum. The urine was negative. The bowels were constipated. The patient complained of extreme weakness, shortness of breath on exertion, and dizziness when she changed her position suddenly.

Examination of the blood showed hæmoglobin, 25 per cent.; 848,000 red cells; 3500 whites; 21 nucleated red cells, of which 7 were megaloblasts. Poikilocytosis was very marked, and polychromatophilia present.

On restorative tonics the patient improved rapidly, so that on August 14th the hæmoglobin was 48 per cent., the red cells 1,624,000, still giving a high color index. There were 6000 whites and 12 nucleated red cells, all of which were normoblasts. The patient was so improved in strength that she left the hospital, and no further observation has been made.

In this case there was a rapid increase of the reds and of the hæmoglobin—100 per cent. in sixteen days. The color index was high and did not fall with the improvement, which is contrary to the usual rule in this disease. The leucocytes rose with improvement. The nucleated reds were few in number. The megaloblasts disappeared with improvement, and poikilocytosis and polychromatophilia decreased.

CASE VI.—Male, aged sixty-one years, married, banker. Seen first on May 10, 1899. His family history was excellent. In the summer of 1898 he first noticed that he was easily exhausted on exertion. There was some coldness of the lower extremities, with numbness. He had dyspnoea on exertion, and some dizziness. The appetite failed in March, 1899, and since then has been very poor. There was a bitter taste which was present in many kinds of food. Has had some gas and weight in the stomach after eating. Bowels were usually regular; urination was normal. There was no pain. His weight was 155 pounds; he weighed 190 when well. He was very pale; there was a lemon-yellow color of the skin. There was a blowing systolic murmur over the præcordium, loudest in the mitral area. There was a venous hum in the neck. There were no other abnormal physical signs. There was a slight trace of albumin in the urine. The blood showed 828,000 red cells, with 25 per cent. of hæmoglobin, and 6000 whites. There were many nucleated red cells, and marked poikilocytosis.

There was improvement under restorative tonic treatment; the patient presenting 50 per cent. of hæmoglobin, and 2,080,000 red cells in September, after which there was a relapse. On October 30th the hæmoglobin was 40 per cent., and the red cells 1,912,000. There were four nucleated red cells per cubic millimetre, of which two were megaloblasts.

This patient has presented from the beginning all of the usual phenomena of a pernicious anæmia. When last heard from he was in California, and becoming gradually worse.

It is to be noted that there is a fall of the color index with improvement, with an inconstant leucocyte count, and but few nucleated red cells.

CASE VII.—Female, aged forty seven years, was admitted to Cook County Hospital, October 14, 1899. She had been transferred from the Detention Hospital for the Insane. She was of unsound mind; could not answer questions intelligently. Her friends gave a history of illness of about three months. Examination showed intense yellow pallor without emaciation. There were many small hemorrhagic spots in the skin of the body and the mucous membrane of the mouth. The retinæ were normal. There was a systolic apex murmur with dulness on percussion extending beyond the left nipple. Spleen not palpable. The bowels were constipated. Examination of the feces was negative. The temperature varied from 98° in the morning to 100.2° in the evening. The urine was negative. The blood gave 18 per cent. of hæmoglobin, 679,000 reds, 2000 white cells, marked poikilocytosis, with 315 nucleated red cells per cubic millimetre, of which 270 were megaloblasts.

On November 3d there was 20 per cent. hæmoglobin, 540,000 red cells, and 128 nucleated reds, of which 84 were megaloblasts. There was extreme irregularity of the nucleus, much poikilocytosis, and marked polychromatophilia. The patient died November 10th. An autopsy was not obtained.

Just before death the color index rose with the decline of the patient. The leucocytes increased slightly, the nucleated reds diminished in number, while the poikilocytosis was extreme and corresponded with the low red count.

CASE VIII.—Male, aged fifty-two years, shoemaker. Admitted to the Presbyterian Hospital in November, 1899. Ill for about a year. For seven months has been subject to fainting attacks, with much weakness, some shortness of breath and dizziness. There has been marked pallor for several months. Bowels alternately loose and constipated. There has been some nose-bleed. The patient has not lost in weight. The skin was lemon-yellow; pulse small, compressible and weak. A blowing murmur was heard over the mitral area and at the base of the heart, transmitted into the neck. Spleen and liver negative; urine negative. Blood examination on December 11th showed 17 per cent. hæmoglobin, 760,000 red cells, 9000 whites, 135 nucleated reds per cubic millimetre, of which 81 were megaloblasts. On December 29th there was 20 per cent. of hæmoglobin, 880,000 reds, 2000 whites, and 15 nucleated reds, of which 9 were megaloblasts. There was much poikilocytosis and polychromatophilia. The patient died in January, 1900. Post-mortem revealed the usual findings of a pernicious anæmia, including foetal bone marrow.

It is to be noted that in this case a few days before death the condition of the hæmoglobin and red corpuscles was stationary. The leucocytes fell with the decline, as did also the nucleated red cells. The poikilocytosis and polychromatophilia corresponded in degree with the number of red cells,

CASE IX.—Female, aged thirty-six years, housekeeper. Seen with Drs. Favill and Storer, September 27, 1899. Has suffered from goitre and symptoms of general nervousness for several years. For a year past has suffered from gradual increasing weakness until prostration occurred, and has been confined to bed for the last three months. There has been a rapid heart, with tremor of the muscles, indigestion with poor appetite and gradual emaciation. There has been headache, with many subjective nervous symptoms, including paræsthesia of the skin, numbness and coldness of the lower extremities, sleeplessness, and at times nausea and vomiting after some emotional disturbance.

Examination shows marked pallor of a yellow hue, emaciation, tremor of the extremities, especially upon exertion, a goitre of moderate size, vascular and throbbing, increase of the heart dulness beyond the left nipple, a murmur in the mitral area, systolic in character, a venous hum over the neck, and especially over the goitre, a pulse of 140 per minute, weak, quick, and compressible. Temperature subnormal in the morning and elevated to 99° or 100° in the evening. Negative findings over the abdomen; the urine free of abnormal elements. The pelvis normal. The blood on September 27, 1899, showed 20 per cent. of hæmoglobin, 864,000 red cells, 6,000 whites, with 6 nucleated red cells per cubic millimetre, all megaloblasts. Some of the nucleated cells showed irregularity of the nucleus. There was poikilocytosis and polychromatophilia.

The clinical course and physical finding made a diagnosis of exophthalmic goitre probable, although there was no exophthalmos present upon examination, nor any history of that sign. The patient died in November, 1899, showing no change in the condition enumerated above. No autopsy.

Neusser (*American Year Book of Medicine*, 1900, page 127, quoted from the *Wiener klinische Wochenschrift*, April 13, 1899) describes a case of exophthalmic goitre occurring with pernicious anæmia. In the case reported here it is to be noted there was a small number of nucleated red cells, but they were all megaloblasts.

CASE X. (See Chart I.)—Male, aged thirty-six years, a collector, married. Patient had a severe attack of influenza in January, 1899. He was confined to bed for ten days; otherwise his health had been good since childhood. Following illness in January he had remained unwell, had grown pale, and had noticed a progressively increasing weakness, with slight dizziness and dyspnoea upon exertion. The extremities were often cold, and there was palpitation of the heart at times. The appetite was good, and digestion unimpaired. The bowels were slightly constipated. The patient had no other discomfort than those enumerated.

Examination showed no emaciation, lemon-yellow pallor, a few petechial spots about the chest and base of the neck in front, and a few in the

roof of the mouth. There was a murmur over the base of the heart transmitted into the neck, and a venous hum was also heard over the large vessels of the neck. The urine was normal, and the physical findings over the abdomen negative. The blood showed no plasmodia, with 33 per cent. of hæmoglobin, 2,000,000 red cells, 16 nucleated cells, of which 8 were megaloblasts; poikilocytosis and polychromatophilia present.

Upon restorative tonics the patient did not improve. There was a gradual decline in health, evidenced by the blood-findings which, on

CHART I.

CASE X. a. Red corpuscles. b. Hæmoglobin. c. Nucleated red corpuscles. d. Leucocytes.

September 6th, showed hæmoglobin of 27 per cent., 1,800,000 reds, 5,000 whites, 100 nucleated red cells, of which 80 were megaloblasts, with the ordinary associated irregularity in size and shape of cells and polychromatophilia. Improvement occurred from this time onward, until at the last examination, when there was 74 per cent. of hæmoglobin, 4,010,000 red cells, 6500 white cells, and no nucleated cells. This patient is still under observation and presents phenomena which unmistakably confirm the first diagnosis, and show that he is still ill, although the blood condition is so much improved.

In this case the color index was nearly always high, the tendency being to decrease slightly with the improvement. The leucocytes increased usually with the general improvement of the patient. There was a flood of nucleated red cells, the so-called crisis before improvement, and these disappeared with the improvement. Megaloblasts predominated. Poikilocytosis and polychromatophilia were markedly less than is usual in patients with a corresponding red count. The improvement wave in this case has continued steadily for about six months.

CASE XI. (See Chart II.)—Male, aged forty-five years, lawyer. Gives a history of illness extending over one year. Seen in consulta-

CHART II.

CASE XI. a. Red corpuscles. b. Hemoglobin. c. Nucleated red corpuscles. d. Leucocytes.

tion with his physician, Dr. A. J. Coey. Patient has always been a hard worker, taking but little rest, and having large responsibilities. He has suffered from no illness during his life until at present. An examination on December 29, 1898, showed no loss of weight, but a lemon-yellow pallor, with a small, quick, compressible pulse, and normal temperature; a weak heart-beat, with a faint systolic murmur at the base; no venous hum in the neck. Negative findings over the chest excepting as stated, and over the abdomen. Urine normal. Patient complained of weakness, with shortness of breath on exertion, dizziness, palpitation of the heart, poor appetite and some gaseous indigestion.

Blood count showed 40 per cent. of hæmoglobin, 2,228,000 red cells, 3500 whites, 70 nucleated reds, all of them normoblasts; poikilocytosis and polychromatophilia present.

During the remainder of the winter patient improved to some extent, his red cells increased to 3,276,000, his hæmoglobin to 65 per cent., white cells to 7200, and nucleated cells disappeared. There was a relapse in June of 1899, and on July 31 the hæmoglobin was 23 per cent., the red cells 886,000, the whites 3500, and 392 nucleated cells were found per cubic millimetre, of which 308 were megaloblasts. Irregularity of the nucleus; poikilocytosis and polychromatophilia were marked. The physical findings were practically the same as when the patient was first seen six months before. He declined from this time on, and died the latter half of August. About two weeks preceding his death the patient had direct transfusion of six ounces of human blood by his own request. This was followed by no improvement in the blood, nor did hæmoglobin appear in the urine. Autopsy revealed the ordinary findings of a pernicious anæmia, including the foetal bone marrow.

The color index diminished with improvement, but did not change to the degree often seen in other cases. This was probably due to the fact that the improvement was very slow, so that the hæmoglobin kept pace with the rise in the number of red cells. The leucocyte increase occurred with improvement, as is the rule, but there was only a slight leucocyte increase before death. The nucleated red cells were large in number, but did not increase to any great extent immediately preceding death, as was noted in Case III. The poikilocytosis and polychromatophilia corresponded in degree to the red count. The improvement wave lasted about five months.

CASE XII.—Female, aged sixty years. Has borne nine children. Seen first as a private patient on October 24, 1899. Family history good. Has had dyspepsia, with the formation of a good deal of gas at times for the last two years. For two years health has been failing. For six months had a dull, gnawing pain in the region of the stomach, not influenced by food. Has vomited two or three times a week for the last two or three months, and nearly every day for the last two weeks. No blood in the vomited matter. Appetite usually good. Bowels were constipated. Complained chiefly of weakness and want of endurance, palpitation of the heart, shortness of breath, with dizziness and faintness. There was some frontal headache and paræsthesia, especially of the lower extremities. There has been some loss of weight, from 165 to 130 pounds. There has been a gradually increasing pallor. Examination showed a yellow pallor with pale mucous membranes; pulse rapid, weak and compressible; capillary pulse in the lips. Heart-sounds were weak without murmurs. Abdomen and pelvis negative. The urine showed a slight trace of albumin, otherwise normal. The blood showed 32 per cent. of hæmoglobin, 2,100,000 reds, 8000 whites, and 49 nucleated red cells per cubic millimetre, of which 24 were megaloblasts. Irregularity of the nucleus; poikilocytosis and polychromatophilia present. Under restorative tonics the patient improved in strength, and on December 6th the hæmoglobin was 48 per cent., reds, 2,348,000; whites, 9000; nucleated red cells 8, of which 4 were megaloblasts. The patient lives in Iowa, and a relative has just informed me that she continued to improve until the first part

of March, but since that time there has been a return of the old symptoms, with increasing pallor, weakness, etc.

The color index rose with improvement, which was gradual, and the rise was therefore slight. The leucocytes were inconstant in number; the nucleated red cells decreased with the improvement, and the megaloblasts lost their preponderance over the other forms with improvement. The poikilocytosis and polychromatophilia corresponded with the red count.

CASE XIII. (See Chart III.)—Female, aged sixty years, copyist. Has borne two children. Was admitted to the Cook County Hospital on September 8, 1899. For six months the patient has complained

CHART III.

CASE XIII. a. Red corpuscles. b. Hemoglobin. c. Nucleated red corpuscles. d. Leucocytes.

of weakness, faintness, shortness of breath, palpitation of the heart, coldness of the extremities, and general nervousness. She has had nose-bleed twice. There has been no loss in weight, but the symptoms above enumerated have become so marked that she was obliged to go to bed. Examination showed a lemon-yellow pallor, with some œdema of the eyelids and of the ankles. Pulse was small, rapid, compressible and weak. A soft murmur was heard over the heart, transmitted into the vessels of the neck. A venous hum was also heard in the neck. The spleen was palpable, and the liver extended two finger-breadths below the right costal arch. The urine was normal, and the pelvis negative. There were no hemorrhages of the skin, and the retinæ were normal.

The temperature was elevated for the last two days following an attack of diarrhoea. The stool was watery and loose and contained no parasites. A blood examination showed 25 per cent. of hæmoglobin, 960,000 reds, 3000 whites and 36 nucleated cells per cubic millimetre, of which 12 were megaloblasts, 12 microblasts, and 12 normoblasts. Irregularity of the nucleus, poikilocytosis and polychromatophilia present.

Under restorative tonic treatment the patient improved rapidly, and on November 26th, just previous to leaving the hospital, the hæmoglobin was 44 per cent., red cells 2,736,000, white cells 1500, with 3 nucleated cells, all megaloblasts, present, with a continued but lessened poikilocytosis and polychromatophilia. The improvement continued. A blood examination made on March 21st gave hæmoglobin 72 per cent., red cells 3,720,000, and whites 6000; no nucleated cells, but poikilocytosis and polychromatophilia still present. In spite of the evident improvement in the blood, the patient complained of great weakness. She is undoubtedly at the top of an improvement wave.

CHART IV.

CASE XIV. a. Red corpuscles. b. Hæmoglobin. c. Nucleated red corpuscles. d. Leucocytes.

CASE XIV. (See Chart IV.)—Female, aged twenty-nine years, married. Has borne no children. Was admitted to the Cook County Hospital on November 3, 1899. The patient gives a negative history as to previous illness of any severity. Present illness began six months ago with diarrhoea in August and September. She has also had some cough with bloody expectoration. There has been shortness of breath

with palpitation, great weakness, dizziness on changing the position of the body suddenly, dimness of vision, some headache, and intercostal pain, and paræsthesia of hands and feet. Examination showed a lemon-yellow color without emaciation. The pulse was rapid and feeble. A blowing murmur was heard over the base of the heart, transmitted into the neck. There was no venous hum. The lungs, the abdomen, and the urine were negative; the stools were formed and no parasites were found. The blood examination showed hæmoglobin 22 per cent.; red cells, 744,000; white cells, 1000; 115 nucleated cells per cubic millimetre, of which 85 were megaloblasts. Poikilocytosis was very marked, and polychromatophilia was present.

Under restorative tonic treatment the patient improved gradually, as is shown by numerous blood examinations, until January 18, 1900, when the best condition prevailed. At this time hæmoglobin was 62 per cent.; reds, 2,650,000; whites, 6000; nucleated red cells, 24, of which 12 were megaloblasts; poikilocytosis much less than formerly, and only slight polychromatophilia. At this time the patient complained of soreness of the throat, and an examination showed a syphilitic gumma of the soft palate. She was placed upon large doses of iodide of potash and inunctions of mercury. The gumma rapidly disappeared, and the throat was healed within one month. From this date, however, the patient again declined in health, lost in weight and strength, had dizziness, dyspnoea, and palpitation on exertion. There was a murmur at the apex of the heart, and a very weak and compressible pulse. An examination, made on April 10th, showed hæmoglobin 20 per cent., a fall of over 40 per cent. in less than three months; red cells, 1,132,000; whites, 3500; nucleated cells 116 per cubic millimetre, of which 102 were megaloblasts; increased poikilocytosis and polychromatophilia.

This patient suffered from syphilis, although she denied all knowledge of acquiring the disease. What relation the syphilis bore to the blood state is questionable. Under anti-syphilitic treatment the blood became rapidly worse, but this is, of course, no proof that the blood state even of pernicious anæmia may not be caused by syphilis.

Following the rule, the color index fell with improvement in this case, but continued to fall with the decline. The leucocyte count corresponded in degree to the number of reds and the percentage of hæmoglobin. In this case, too, there was a flooding of nucleated reds before improvement, corresponding partially to von Noorden's law. The nucleated reds disappeared once during the stage of improvement, and increased again with the decline. The megaloblasts were in excess. The poikilocytosis and polychromatophilia corresponded to the number of reds. The improvement wave continued for about five months.

CASE XV. (See Chart V.)—Male, aged forty-three years, married, an engineer, was admitted to the Cook County Hospital on April 19, 1899. Gave a negative history of tuberculosis and carcinoma in the family, and denied venereal disease. Was always healthy until present trouble. For two years has felt tired and weak, sleepy, and has been told that he looked paler than usual. Was annoyed by a pain and weight in the stomach, with eructations of gas after meals. Twenty-one months

ago gave up work and was in a hospital for three weeks. He again went to work after three weeks for about a year. During the last period, when at work, he was troubled with shortness of breath and palpitation upon severe exertion, and frequently had bleeding of the gums. Recently he has had no appetite; has had pain in the stomach after eating, and has vomited at times soon after the meal.

The bowels have been constipated. Examination showed a lemon-yellow pallor without much loss of weight, with general negative findings, including the chest, the abdomen and the kidneys. After a test meal no hydrochloric acid was found in the stomach contents, while

CHART V.

CASE XV. a. Red corpuscles. b. Hæmoglobin c. Nucleated red corpuscles. d. Leucocytes.

lactic acid was in excess. A blood examination, made on May 20, 1899, showed 32 per cent. hæmoglobin, 726,000 reds, 5000 whites, 30 nucleated cells per cubic millimetre, of which 20 were megaloblasts, poikilocytosis and polychromatophilia.

The patient improved until October, 1899, the red cells increasing to 3,500,000, and hæmoglobin to 60 per cent., the nucleated cells disappearing. Then there was a relapse, with a low ebb in December, when the hæmoglobin fell to 22 per cent., red cells to 880,000, the nucleated reds to 32 per cubic millimetre, of which 28 were megaloblasts, while poikilocytosis and polychromatophilia were very marked. Again, improvement occurred under restorative tonics and rest in bed until the latter part of

March, 1900, since which time there has been again a decrease in the hæmoglobin, in the red cells, and an increase in the nucleated reds, and in the irregularity of the cells, and increased polychromatophilia.

This man presented in every way a classic case of pernicious anæmia. His physical findings were negative. Frequent examinations of his stomach contents, after a test meal, showed the constant absence of hydrochloric acid, free and combined, and lactic acid always present, usually in large amount. He is at present upon the downward curve.

The color index was nearly always high, but fell with improvement, and increased with each decline. The nucleated cells disappeared in the

CHART VI.

CASE XV Differentiation of leucocytes in absolute numbers per cubic millimetre.

first improvement wave, and reappeared with the decline. They increased with the second improvement, amounting to a crisis. The first improvement wave lasted six months, the second about four months. Poikilocytosis was very marked, even when the reds were in largest number. Polychromatophilia varied with the number of reds.

The patient died on May 21, 1900. The death was not known to the writer for two weeks, and hence no autopsy was made.

CASE XVI.—Male, aged forty-eight years, married, a capitalist. Seen first on January 1, 1900, with Dr. Franklin Hays, of Indianapolis,

Ind. Gave an excellent family history, with good habits. Venereal disease denied. Has not been well since 1895, when he was almost suffocated by smoke while exhibiting an invention to protect firemen from smoke. Since then he has had suffocative attacks, with dizziness, and occasionally abdominal pain. Bowels have been constipated. He has lost in strength without loss of weight. There have been palpitation, shortness of breath on exertion, and dizziness when moving suddenly or under excitement. Appetite has been variable, and digestion usually good. Was in Europe in the fall of 1899, and a blood examination was made in London by Dr. Severs, which showed hæmoglobin, 25 per cent., reds 2,200,000, and whites 20,500. For the last six months there has been a more rapid decline in strength and endurance until at present the patient is confined to bed by extreme weakness.

Examination showed a very pale lemon tint without loss of weight. The pulse was small, quick, 108 per minute, the temperature 102 at the time of examination. A loud systolic murmur was heard over the præcordium, loudest in the mitral area. The second sound accentuated in pulmonic area. No murmur in the vessels of the neck. A few moist râles were heard on deep inspiration over the lower portion of the lungs behind. The abdomen showed the liver with normal area, the spleen palpable. Rectum, negative. A small nodule, the size of a navy bean, in the left epididymis. Eye-grounds, normal. The blood showed hæmoglobin, 15 per cent.; red cells, 912,000; nucleated cells, 21 per cubic millimetre, of which 14 were megaloblasts. Marked irregularity of nucleus, poikilocytosis present with polychromatophilia.

A blood examination, made June 6, 1900, showed hæmoglobin, 19 per cent.; red cells, 762,000; whites, 7000; nucleated red cells, 21 per cubic millimetre, of which 14 were megaloblasts and 7 normoblasts. Polychromatophilia and poikilocytosis present.

This patient presented every condition, as far as the appearance and physical findings go, of a pernicious anæmia, and although the color index is relatively low, the other conditions of the blood make the diagnosis practically certain.

CASE XVII.—Male, aged forty-six years, married, American. Was seen on March 28, 1900. Negative history as to inherited disease; good habits; venereal disease denied. Lived in South Dakota for several years, and immediately preceding the present illness used the alkaline waters of that region to drink. Present illness began about fifteen months ago. He first noticed signs of weakness and lessened endurance, then had a rather severe serious diarrhœa. He noticed that the skin was yellowish and very pale. Since that time has had some fermentative dyspepsia, with diarrhœa off and on, the bowels usually loose.

During the first half of 1899 there was some improvement, when the patient came to Wisconsin to remain with his father's family. He gradually became weaker and was confined to bed in September, 1899, and had a severe watery diarrhœa. He lost some in weight. Again, there was improvement until the first of February, 1900. Since that time there has been a rapid decline of health, with weakness, palpitation of the heart, dyspnœa on exertion, and a suffocative feeling with post-sternal pressure, sometimes radiating to the arms when excited or when walking up stairs. In February, 1900, a blood examination made

by the Columbus Medical Laboratory of Chicago showed hæmoglobin, 37 per cent.; reds, 1,702,000.

Examination showed a well-nourished man as to weight, with a lemon-yellow pallor; pulse small, 130 per minute; heart area normal; a soft systolic murmur at the base and apex, the murmur transmitted into the neck. A loud venous hum in the neck. The lungs, the abdomen and the pelvis negative; slight œdema of the ankles. The retinæ normal; no petechial spots; the urine contained a great number of crystals of uric acid, but no abnormal ingredients. Blood examination showed hæmoglobin, 20 per cent.; reds, 701,200; whites, 4140; 32 nucleated cells per cubic millimetre, of which 24 were megaloblasts. Poikilocytosis was very marked, and polychromatophilia present. This case is one of undoubted pernicious anæmia.

The case shows a very low red count, and is remarkable in that the megaloblasts are very large, and show a very tense irregularity in shape of the nucleus, characteristic of extreme degeneration. Poikilocytosis was extreme. The patient died at his home in Wisconsin during the first half of April. No autopsy.

CASE XVIII.—Male, aged fifty-five years, married, American, civil engineer. Seen April 1, 1900, with Drs. Staples and Hancock, of Dubuque, Iowa. Family history negative; venereal history negative. Good habits. His wife has borne no children. During the summer of 1899 patient noticed that his color was not as ruddy as formerly, and that he had lost energy and became fatigued quickly. Dr. Hancock found negative physical conditions except of the blood, which, on November 12th, gave 2,550,000 red cells. The hæmoglobin was not estimated.

Restorative tonics in the form of iron and arsenic were used, but the patient gradually lost ground. On January 2d, Dr. Hancock found red cells, 1,980,000, with many megaloblasts, and marked poikilocytosis. Patient's weight was 155 pounds, the usual weight for the last few years. He complained of great weakness and prostration. He had palpitation of the heart, ringing in the ears, and was dizzy when he changed the position of the body. Appetite was good until recently. The bowels were usually constipated. The patient had no pain. There was a lemon-yellow colored skin. Pulse was small, weak, and 80 to the minute. There was a soft systolic murmur heard at both the apex and base of the heart, loudest over the aortic area, transmitted into the neck. The second sound in both the aortic and pulmonic areas was accentuated. There was a venous hum in the neck. The lungs were negative; the spleen was negative; the liver extended from the sixth rib to one inch below the costal margin in the mammary line, and the edge was hard and resistant. The pelvis was negative; the reflexes, both deep and superficial, were normal; the urine was normal, with much uric acid deposited in crystals. Blood shows hæmoglobin, 20 per cent.; 1,674,000 reds; whites, 1146, with 5 nucleated red cells, of which 4 were megaloblasts. Poikilocytosis was very marked, and polychromatophilia was present.

On April 18th a blood count was made by Dr. Hancock, which showed hæmoglobin, 20 per cent.; reds, 1,342,000; whites, 1750, with many megaloblasts, and marked poikilocytosis. This case is an undoubted one of pernicious anæmia without discoverable cause.

The color index was below normal, but the nucleated red cells were very large and showed degenerative nuclei. A small white count is notable.

CASE XIX.—Male, aged fifty-two years, banker. Seen on April 13, 1900, with his physician, Dr. B. F. Landis. Family history excellent. Has never used alcohol or tobacco, and denies venereal disease. Has always led a sedentary life. No previous illness except the diseases incident to childhood. Two years ago first noticed lessened energy and strength, gradual decline without incident until the fall of 1899; then was very pale, weak, and without much energy or endurance. Remained up and about until the middle of March, 1900, but since then has been confined to bed.

Examination showed a lemon-color pallor without loss of weight. Pulse weak, 90 to the minute. Heart sounds weak; a systolic murmur heard loudest in the mitral area, and also at the base, transmitted into the vessels of the neck; a venous hum over the veins of the neck. Negative general findings as to liver, spleen, pelvic organs, and the eye-grounds were normal. Cutaneous sensations normal. The breath was fetid, and the tongue was covered with a white fur. Urine, normal. Blood showed 25 per cent. of hæmoglobin, reds, 156,000, whites, 5336, 26 nucleated red cells, of which 24 were megaloblasts. Poikilocytosis very marked, and polychromatophilia present.

June 9th, the blood examination gave hæmoglobin, 30 per cent., red cells, 999,000, whites, 3330, 10 nucleated red cells, all megaloblasts, per cubic millimetre.

The blood has improved somewhat since the first examination, but the patient appears the same, and feels no stronger.

The patient died June 16, 1900. No autopsy was allowed.

CASE XX.—Male, aged twenty-six years, single, American, was admitted to the Presbyterian Hospital, Chicago, June 1, 1900.

No tuberculosis or history of carcinoma in family. Denies venereal disease. Had the usual diseases of childhood before the fifteenth year. In 1890 had a severe attack of la grippe; not as strong as before that time.

Present illness commenced after an attack of la grippe in December, 1898. A year ago noticed weakness, lessened endurance, palpitation of the heart and dyspnoea upon exertion. Tingling, formication, numbness and coldness of feet and legs occurred in January, 1899, and have persisted.

Was told he was very pale. Did not lose in weight. Appetite and digestion remained good, and the bowels were usually regular. Had some fever, he thinks, during the afternoon on several occasions. Contracted a cold two weeks ago, and since that time has had a slight cough with some yellowish sputa.

On examination: bodily weight well preserved, skin very pale and lemon-yellow tint, mucous membranes very pale. Negative physical findings as to lungs, liver and gastro-intestinal tract. Urine, negative. Spleen, palpable. A blowing systolic murmur was heard in the mitral and aortic areas; not transmitted. A venous hum was heard over the large vessels of the neck. Pulse 100 per minute, quick and somewhat water-hammer in character. A capillary pulse in mucous membranes of the lips.

The knee-jerks absent. Cremasteric reflexes present. Skin of lower extremities respond to test for tactile temperature and pain sensations. Subjective paræsthesias of legs present. The blood showed red cells, 756,000, white cells, 3000, hæmoglobin, 30 per cent. No differentiation of white or red cells was made. June 15th a second blood examination gave reds, 980,00, hæmoglobin, 26 per cent., and whites, 8000. Poikilocytosis was very marked. There were 660 nucleated red cells per cubic millimetre, of which 400 were megaloblasts.

GENERAL CONCLUSIONS. Of the twenty cases, twelve were males, and eight females.

The average age was forty-four years, the youngest twenty-four, the oldest sixty-two.

No exciting cause could be found in any case.

There was no special relation to the use of alcohol, nervous shock, overwork, or to previous disease, excepting, possibly, in the one case in which syphilitic gumma of the soft palate occurred.

The symptoms were weakness, which was constant, and present in some degree even when the patient was at the top of the wave of improvement, and dyspnœa and palpitation occurred at some time or other during the course of the disease in every patient. Gastro-intestinal disturbance of some kind, usually fermentative dyspepsia with constipation or diarrhœa, was the rule. A few cases showed a constant tendency to diarrhœa.

The nervous symptoms were frequent, especially paræsthesias of the lower extremities, and headache, with dizziness, was common. Sleeplessness and restlessness occurred in the late stages of the fatal cases.

The lemon-yellow tint was present in every case. In the great majority of the cases there was preservation of the body weight.

Cardio-vascular disturbance was an invariable feature. In every case there was either a murmur over the heart or in the neck, and the radial pulse was weak and compressible.

There was splenic enlargement in five cases. The liver was palpable and enlarged in three cases. In only three cases were the stomach contents examined after a test meal; free hydrochloric acid was absent in all.

The temperature was elevated as a rule, but fever was never high, excepting a few days before death in some of the fatal cases.

A slight albuminuria occurred in five cases.

The stools were negative as to parasites in all but one. In this infusoria in large numbers were constantly present and associated with diarrhœa.

Hemorrhages in the skin, either petechiæ or ecchymoses, occurred in the majority of cases. Retinal hemorrhages, demonstrated by the ophthalmoscope, occurred in four cases.

The hæmoglobin varied from 15 to 74 per cent. (Fleischl), and the red corpuscles from 156,000 to 4,000,000. The color index in 53 of 66 observations was above normal. The lowest was 0.66, the highest 8.9 (?). Four cases showed the color index either constantly or usually low. In eight cases the low color index occurred at some time during the disease. The fall in the color index during rapid improvement took place in five of six cases, the corpuscular richness often becoming less than normal. The hæmoglobin in the course of time caught up with the reds. (See charts.) When improvement was gradual the increase in both elements was *pari passu*. The specific gravity bore a more constant relation to the number of red corpuscles than the hæmoglobin. During rapid improvement it was noticed that there was a tendency of the hæmoglobin to lag behind the other solids of the blood in their upward course. (See charts.)

The leucocytes on the average were below normal. They generally corresponded to the degree of anæmia, increasing during improvement and decreasing during decline. They increased in two cases just before death, a terminal leucocytosis.

A differential count (see Chart VI.) of stained specimens showed an average of 29½ per cent. of mononuclear cells, which is about normal. Very frequently there was a percentage increase of the small mononuclear cells. This would, at first glance, look like an absolute increase of the small mononuclears, and possibly account for the incorrect statements made by authors upon this point. The increase is only relative. It may be observed in these cases that the high percentage count of the lymphocytes was nearly always accompanied by a small number of leucocytes per cubic millimetre, thus bringing the absolute number of lymphocytes per cubic millimetre within the normal limits. What actually took place is a diminution in the number of polymorphonuclear neutrophiles, both relative and absolute.

The eosinophiles showed a disposition to increase with improvement and to diminish with the failing health, but this behavior was too fickle to enable one to formulate a rule concerning them.

The myelocytes were most abundant, broadly speaking, when the patient was low, but they appeared to be of little diagnostic or prognostic importance. These cases seem to show that the nucleated red cells are an essential feature of the disease. They were present in every case, although they often disappeared when the patient made a decided gain in health. The actual number was sometimes very large; in one case 10,336 per cubic millimetre, but more often it was small. The average number present in a cubic millimetre, with the exception of the case in which the number was so large, was 71. With this small number it often requires a prolonged search to discover them in the ordinary smear.

In individual cases a comparison of the number of nucleated red cells present from time to time was of considerable value, but when a small number was present it was not necessarily a favorable sign. Many subjects were characterized throughout by a scarcity of nucleated reds, and again they were diminished before death. The *quality* of the nucleated cells seems of greater significance than the number. The regenerative forms or normoblasts are of little consequence, but the degenerative forms or megaloblasts are very characteristic. In many cases they were present, and in fact the diagnosis could not well be made in their absence. The proportion of megaloblasts varied with the severity and stage of the disease, usually gaining a numerical ascendancy over the normoblasts when the disease was advanced. Irregularity of the nucleus in the normoblasts often means an attempt at division; in the megaloblast it is more often an incident in the process of degeneration and absorption of the nucleus. Megaloblasts, therefore, which have irregular nuclei, represent a greater degree of degenerative change than the ordinary variety. This peculiarity was noted in almost every one of the series, and often when other findings were not decisive. This variety of nucleus is probably seen rarely, if at all, in secondary anæmias.

Poikilocytosis was present in all cases, and in no case did it entirely disappear at any stage of the disease, including the period of greatest improvement.

Polychromatophilia was present at some time in all of the cases, but was not a constant factor during the course of the disease, and especially during the stage of improvement.

To my assistant, Dr. Joseph A. Capps, I desire to acknowledge much valuable aid in the collection of clinical data and in making blood examinations.

A REPORT OF TWO CASES OF FILARIASIS.

OPERATION FOR LYMPHATIC VARICES AND CHYLOUS HYDROCELE, WITH
REMOVAL OF ADULT WORMS.¹

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AND

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FILARIASIS is a parasitic disease which is very common in many tropical countries, in some of which it is a scourge. In northern countries it is rarely encountered, and its numerous manifestations, conse-

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May, 1900.

quently, are but little understood. It is probable that cases are repeatedly unrecognized.

The nature of the first case which is here reported was not recognized when he entered the hospital. The reasons are: First, because the disease was not suspected, and, second, because the lesions which he presented at that time were not characteristic, so that under repeated similar circumstances there would be no objective signs particularly suggestive of filariasis, and only a blood examination would be positive. Consequently, we have decided to present the features of these cases as we encountered them.

CASE I.—On September 20, 1899, C. A., aged twenty-two years, entered one of the surgical wards of the Boston City Hospital with the history of sudden onset of pain across the small of the back while lifting a bale of paper. This pain increased in severity, so that at the end of half an hour he could not remain standing, nor could he lie in one position any considerable length of time. The pain extended around to the left groin and down into the left testis. There was a desire to urinate frequently, but micturition did not give any relief. He felt dizzy and nauseated, but did not vomit. His temperature was normal. The urine was normal. Physical examination was negative.

The condition of the patient at this time was not such as particularly to attract the attention of the visiting surgeon. Two days later all of his subjective symptoms had disappeared, and he was discharged from the hospital feeling perfectly well.

He resumed his work as a bookkeeper, but soon noticed that there was a swelling in the left side of the scrotum which extended up to the groin. This swelling disappeared on lying down. There was some discomfort when he was walking about; he got tired easily, and his condition was a source of worry to him.

On account of this swelling he entered the hospital a second time, and became a patient in the service of Dr. H. L. Burrell, and was then seen by the writers for the first time.

Sufficient examination was made to show that the left testicle was somewhat enlarged, but not tender, and that the cord was thickened by the presence of a mass of vessels which led to the external abdominal ring. On lying down these vessels decreased in size, and clinically corresponded to a case of varicocele. The external abdominal ring admitted the finger-tip readily, and there was a marked impulse and a slight hernial protrusion on cough.

His condition seemed to correspond to a varicocele complicated by a small inguinal hernia, and without particular attention being paid to his history, and without making further examination, he was prepared for operation. Under ether the usual incision for inguinal hernia was made and the cord exposed from the internal ring to the testis by drawing the latter toward the lower end of the four-inch incision. A small hernial sac was isolated and ligated, and the posterior wall of the inguinal canal restored in the usual manner. The cord itself was about the size of the index finger and was composed of about ten thick-walled tortuous vessels or tubes, in addition to the usual structures. There were two or three large veins to be seen which could be recognized by

their dark color, but the remaining structures were light-colored and about the size of the veins in a varicocele. They were considerably distended and their walls were thick. It was decided to excise this mass of vessels for the whole length of the cord, as in a varicocele operation. On dissecting this mass from the surrounding structures it was noticed that minute quantities of a thin, milky fluid appeared in the field of operation. Unfortunately at the time this fluid became mixed with blood and could not be collected. The appearance of this fluid and the color of the excised tubes were the features that first made us suspect that there was something unusual in this case. The hernia and varicocele operation was completed and the wound closed.

The patient recovered well from the operation and the wound healed by first intention.

Pathological Report of Excised Mass. Macroscopical examination by Dr. Howe: "The specimen consists of a mass of dilated vessels and some fat. It is 12 cm. long, 1 cm. across, and 0.5 cm. thick. The vessels have firm, thickened walls, and do not collapse on being cut across. The largest vessels have a diameter of 2 mm." Microscopical examination: "Dilated and thickened veins.

The future history shows that these structures were not veins, although they resembled them under the microscope, and some of them contained blood. At the time of operation we felt certain that they were not veins on account of their light color when contrasted with veins near by, and the escape of small quantities of milky fluid.

Progress of Case—December 5th. Stitches out, linear scar healed by first intention; no redness, tenderness, or induration. For two weeks longer the patient remained in bed and wore a protective dressing. Meanwhile there was a gradually increasing swelling of the left side of the scrotum, which was examined carefully on December 19th.

The skin of the scrotum was normal, and consequently showed no signs of redness or thickening. The swelling was larger than a hen's egg and globular. It was smooth, fluctuant, and not tender, and transmitted light as freely as an ordinary hydrocele. At the upper end of the tumor could be felt the stump where the cord was excised. The tumor was aspirated with the following result:

Pathological Examination by Dr. Low. "Specimen consists of about 90 c.cm. of opaque, chrome-colored fluid, which microscopically shows large numbers of embryo filariæ in active motion. There are numerous small round cells, a few red blood-corpuscles and oil globules, and a large amount of fatty granular material."

Chemical Examination by Dr. Ogden. "Reaction neutral; specific gravity, 1018; albumin, 1.5 per cent.; fat, 1.53 per cent.; chlorine, 1.95 per cent. The fluid was completely clarified by shaking with ether after the addition of sodic hydrate. Diagnosis: Chyle in an inflammatory serous fluid."

19th, 7 P.M. Blood examination shows many filariæ. Differential count of leucocytes made by Dr. Steensland:

Small lymphocytes	35.33 per cent.
Large lymphocytes	3.00
Transitionals	0.67 3.67 "
Polymorphonuclear leucocytes	56.67 "
Eosinophiles	4.33 "
	— 100 per cent.

300 leucocytes counted.

20th. Wound from ear examined at 3:15 P.M.: no filaria found in blood. 21st P.M. Patient was seen in bed one hour: seventeen large nodules, with the aid of minute scale in each of two large areas.

The lymphatic system was fully examined and the obscure features of the case were easily explained.

At the time of operation he had a small inguinal hernia. The condition of the lymphatic system was a collection of dilated and thickened lymph vessels, which extended into the testis, thereby increasing its size.

There was no fluid in the tunica vaginalis testis until after the operation, and its appearance is readily explained by the fact that most of the return lymph vessels had been excised. The tumor in the scrotum following the operation was a chylous hydrocele, for the most part, but was also due to the increasing size of the testis in consequence of the dilating of the obstructed lymph channels.

Previous History. It was known at entrance that this patient had lived on the Island of Barbadoes, and when questioned as to his past history, he said nothing about any previous sickness, and there was nothing observed that led us to suspect that we were dealing with a case of filariasis. The disease is so rare in northern latitudes that it is not suspected and its clinical manifestations are but little understood. The commoner symptom—chyluria—was absent, and the urine was normal. Furthermore, the patient, who is a fellow of considerable intelligence, knew that he had suffered from filariasis, but said nothing about his past history because he thought his present condition had nothing to do with any previous sickness. We then obtained the following history:

He was born on the Island of Barbadoes in 1878, where he lived for seventeen years. He was on his way to school one morning in September, five years ago, when he was seized with sudden pain across the lower back and lumbar regions and also in the left groin. It was so severe that he thinks it caused him to faint. He was carried home and put to bed. This is the first sickness that he can recall. This attack of pain was followed by a chill, which, in turn, was followed by others. There was more or less nausea and headache. He was given quinine and arsenic for a period of three months, and remained in bed for five months. During that time he was not very sick, but suffered mostly from weakness and debility. He had recurrent febrile attacks, during which the glands in the left groin were swollen and the left testis was enlarged. The glands remained swollen for about three months, but the testis became permanently enlarged. Chills and febrile attacks lasted about three months, with decreasing severity. During this period he was troubled with persistent drowsiness by day. Even up to the time of operation drowsiness has been a feature in his case. His attack was diagnosed at the time as "Barbadoes fever," also called "fever and ague," and was understood to be due to filariæ. He remained in bed for such a long period, although not very sick, on account of the prevailing opinion that lymph scrotum and elephantiasis are thus avoided.

Ten months after the first attack he had a second one, which came on suddenly, and he was more or less prostrated for a month. The swelling of the left inguinal glands recurred, accompanied by the same constitutional symptoms. This time the glands were tender and the skin over them reddened. The testis gained in size, but became smaller later. He was not allowed to walk during this month.

On recovering from this attack he went to Montreal, Canada, and continued to go to school for about two years. Then he went to New York, served a brief period as a bookkeeper, and enlisted in the militia, and then spent some months in South Carolina. Somewhat over a year ago he came to Boston, where he was occupied as a bookkeeper.

During this period of about four years since leaving the Barbadoes he has never been perfectly well and strong, but he has never had a severe attack similar to those from which he suffered at home. On an average of about once a month he would have a chill, followed by moderate fever for a few days. There would be a dragging sensation in the left groin, but no particular pain, and he felt languid and unable to work. At times there was pain in the back. It was one of these attacks that caused him to enter the hospital in September, but as he attributed the condition to heavy lifting, and was apparently well in two days, the true cause was not detected.

On leaving the hospital he resumed his work, but found that he got tired easily and could not work regularly, and was becoming discouraged. He had made up his mind to return to Barbadoes, when he had another attack of pain in the back and left groin, followed by increased malaise and mental depression, and he entered the hospital again, when we saw him for the first time. All of this history, however, he carefully avoided telling us, thinking that it had nothing to do with his present complaint.

21st. Second Operation. Having established the diagnosis beyond question, he was advised to have this whole tumor mass in the left scrotum removed, if thought advisable at the time of operation, and he readily consented. On the morning of the operation there were no embryos found in the blood. The skin of the scrotum was still perfectly normal and the inguinal glands were not enlarged nor tender. The tumor mass, which consisted of the left testis, together with some fluid in the tunica vaginalis, was not tender.

Under ether narcosis the original incision was extended a short distance on to the scrotum, the skin dissected from the tumor, and the whole mass removed without cutting into any part of it. The wound was closed without disturbing the site of the first operation. At 9 P.M. no embryos were found in the blood.

So far as the wound was concerned the patient made an uninterrupted convalescence.

Examination of the Excised Tumor. The specimen consists of a testicle with the intact sac of the tunica vaginalis. The mass is ovoid in shape, 10 cm. long, 6.5 cm. wide, 4.75 cm. thick. The sac contains about 50 c.cm. of a yellow semi-opaque fluid. The tunica vaginalis is smooth and glistening. The parietal layer is slightly thickened and semi-opaque. The spermatic cord at the point sectioned is 1.5 cm. in diameter. Near the testicle it enlarges greatly, measuring 5 cm. in thickness. Between the cord and the globus major is a soft wedge-shaped mass, 3 cm. in width, composed of translucent distended vessels and oedematous fat. The testicle weighs 80 grammes. The globus major is greatly enlarged, measuring 3 cm. in width. It is soft, almost gelatinous, and its surface is marked by tortuous dilated lymph vessels averaging 1 mm. in width. The globus minor and the body of the epididymis are nearly of normal size. The testis propria measures 5.5 x 4 x 3.5 cm. It is very oedematous. The tubules tease out readily. The testicle

is measured in its long diameter. After a few minutes' inspection of the cut surface a writhing coil, 6 mm. in size, is discovered upon the body of the epididymis. A single thread 1.5 cm. long extends from this mass across the mediastinum testis. A free end projects from the top of the coil. Half a centimetre nearer the inferior border of the testicle is a smaller mass. The worms are white, opaque, and thread-like. When the testicle is immersed in warm, normal salt solution the writhing and the coiling of the worms is quite active. When detached from the surface by gentle manipulation they quickly anchor themselves to the surface again. Another tightly coiled bunch is soon seen gradually to rise into view near the mass first discovered.

FIG. 1.

Female filaria Bancrofti, twice natural size.

I and II. Two coils as they appeared on the cut-surface of the testicle. Each consists of a single female worm, somewhat mutilated; their bodies have been cut in two and the uterine tubes and digestive tract have been extruded. III. Complete female worm.

It was subsequently found that this third mass consisted of six worms, two males and four females. One of the males was complete. Of the others only their heads and portions of their bodies, varying from 1 to 4 cm. in length, were obtained.

In salt solution the movements of the worms continued over six hours i. e., until 11 p.m. The next morning all were dead.

The two masses first discovered presented the appearance shown in Fig. 1. They were carefully detached from the testicle and preserved in 5 per cent. formalin. Each mass consists of a single female

worm. The pointed, tapering anterior end is well shown in Fig. 1, 1. When the testicle was incised the bodies of these worms must have been cut and the prolapsed uterine tubes and digestive tract then became inextricably intertwined with the coils.

The following morning an entire female worm was discovered by Dr. Mallory on the outer surface of the testicle. It had evidently crawled out of the tissue into the warm salt solution. When found it presented the appearance shown in the photograph (Fig. 1, III).

22d, 5 P.M. A few filariæ found. Blood examination by Dr. Steensland: 8000 leucocytes, 6,016,000 red blood-corpuscles.

Differential count:

Small lymphocytes	38.2 per cent.
Large lymphocytes	0.2
Transitionals	1.2 1.4 "
Polymorphonuclear leucocytes	55.8 "
Eosinophiles	4.6 "
	<hr/> 100 per cent.

500 leucocytes counted.

23d, 8.30 P.M. Fourteen filariæ found in one drop of blood, eleven in another.

Hæmoglobin	93 per cent.
Leucocytes	7400.

26th. Patient is suffering from pain in the right ear, from which there is a moderate amount of serous exudate escaping. Diagnosis: Acute otitis media. No embryos found in the exudate.

30th. Feces examined; no Charcot-Leyden crystals or other abnormal constituent found.

FIG. 2.



Number of filariæ in cutaneous circulation.

A simple method was devised for obtaining drops of blood of known size. A Thoma-Zeiss pipette for red corpuscles was used and blood drawn up to the mark 1 on the pipette. Then the blood was blown out upon a cover-slip.

The "red counter" had a capacity of 1.2 c.cm. when filled to the mark 101. Hence, the standard drop we used contained 11.9 c mm. of blood.

The average number contained in two drops was taken, and the number of filariæ in each c.cm. of blood calculated.

31st. At 8 P.M. the blood contains 438 filariæ per c.cm.

January 3d. Beginning at noon yesterday, two hourly counts were made for a period of twenty-four hours by Drs. Low, Fulton, and Steensland. The accompanying chart (Fig. 2) shows the nightly increase and decrease of filariæ in the peripheral blood. One slide, made at midnight, contained twenty-five filariæ, the equivalent of 2100 per c.cm. This is the largest number we have ever found.

The ear has become normal in every respect.

9th. Leucocytes, 3500.

Differential count :

Small lymphocytes	37.0 per cent.
Large lymphocytes	4.0
Transitionals	4.5 8.5 "
Polymorphonuclear leucocytes	51.0 "
Eosinophiles	3.5 "
<hr/>	
	100 per cent.

200 leucocytes counted.

15th. Patient discharged from hospital. The wounds are healed firmly, and there are no signs of any trouble at the site of operation.

June 1st. Patient rested a month after he left the hospital, and gained strength rapidly. For the last three or four months he has been working as an orderly at the hospital—a position which requires heavy lifting and considerable hard work.

Since the operation he has worked regularly. He has had no recurrence of the old pains in the back and left groin, nor have the chills recurred. He has gained in strength, and is no longer troubled with periods of general weakness, malaise, and mental depression.

The embryos still persist in his blood.

CASE II.—This man is a younger brother of the patient just considered, and he was asked by us to come for an examination more from curiosity than with the idea that embryos would be found.

He is twenty-one years old, was born in Barbadoes, and left the island with his brother, and they have been together more or less since. As a rule, he has always enjoyed good health and has always been able to go about and attend to his work. He has never had malaria, but occasionally he has suffered from what he calls "bilious attacks." He has never had any symptoms or manifested any objective signs which could with any degree of certainty be attributed to filariasis. The patient walked to the laboratory at 8 P.M., and the examination was made at once.

It was found that his blood contained numerous embryos of the *filaria nocturna*, showing that adult worms must be present in his deeper lymphatics, although there is no clue as to their location.

He feels perfectly well in every respect, and his case has not been studied further.

HISTORY. Demarquay¹ discovered in Paris, in August, 1863, the embryos of *filaria Bancrofti*. The patient, a young man, a native of Havana, suffered from a chylous hydrocele, in the fluid of which the filariæ were found. Lemoine, who made the microscopical examination, writes as follows: "Mais l'attention fut surtout attirée par un animalcule de forme allongée et cylindrique. Les quatre cinquièmes antérieurs du corps avaient à peu près la même diamètre. Le cinquième postérieur allait s'effilant de plus en plus et se terminait par une extrémité excessivement fine. Ce ver présentait des mouvements extrêmement vifs d'enroulement et de déroulement dans ses diverses parties et surtout dans son extrémité terminale." Demarquay's paper is accompanied by an admirable picture of the embryos.

The credit of the discovery is usually wrongly ascribed to Wucherer,² who, in Bahia, Brazil, in August, 1866, found embryos in the urine of a case of tropical chyluria. In 1868, Salisbury,³ in the United States, found the ova in the urine. Lewis,⁴ in India, in 1872, discovered embryos in the blood of man, and noted that their presence was generally associated with chyluria and lymph scrotum. He proposed the name *filaria sanguinis hominis*.

Much of our knowledge of the life-history of the parasites is due to the really brilliant discoveries of Patrick Manson, whose scientific studies in this field have embraced a period of over twenty years. In 1878, Manson⁵ discovered that the mosquito was the immediate host. This idea occurred almost simultaneously to Bancroft and Manson, but to the latter belongs the credit of demonstrating its truth. Manson found that the *filaria* embryos, ingested with the blood, develop in the stomach of the female mosquito. The mosquito seeks stagnant water in which to deposit her eggs; when death occurs the filariæ are liberated, and if the water be drunk they pass into the human body.

Lewis⁶ confirmed Manson's discovery and described and depicted the development of the larvæ in mosquitoes. He showed that some of the filariæ pierced the walls of the mosquito's stomach and underwent developmental changes in the abdominal and thoracic tissues. Low⁷ has recently made the important observation that the filariæ migrate to the head and proboscis of the mosquito. He infers from this that when the mosquito next feeds on man the filariæ enter the human tissues.

It was these observations upon the mosquito that led Manson⁸ to suggest to Major Ross, in 1896, that it might also be the intermediate host of the malarial parasite.

Filarial periodicity was discovered by Manson.⁹ He found that the embryos were present in the peripheral circulation only during the night. He believes this periodicity is an adaptation to the habits of the mosquito.

Mackenzie¹⁰ showed that if the patient's habits were reversed, so that

he slept by day and worked by night, the filarial migration was reversed. Mackenzie gives a chart of the filarial curve, showing the daily rise and fall most graphically. A blood examination was made every three hours, day and night, for a period of ten weeks.

Manson¹¹ has recently been able to demonstrate that filariæ when absent from the cutaneous circulation are lodged in the larger blood-vessels, especially of the lungs.

In addition to the well-known *filaria sanguinis hominis* of Lewis there are a number of other species. Six have now been described. Manson¹² has named the original hæmatozoan of Lewis, *filaria nocturna*; the others he calls *filaria diurna*, *filaria perstans*, *filaria Demarquaii*, *filaria Ozzardi*, and *filaria Magalhaesi*.

The *filaria nocturna* and the *filaria perstans* are the only ones that are thought to be pathogenic. In 1891, Manson¹³ found the embryo form of *filaria perstans* in the blood of a negro from the west coast of Africa. It observes no periodicity, being found in the peripheral circulation both day and night. It is much smaller than the *filaria nocturna* and differs somewhat in structure. The adult worm was discovered by Daniels¹⁴ in British Guiana in 1898. Manson regards the *filaria perstans* as the possible cause of the sleeping sickness of the negroes of the west coast of Africa, and the skin disease *craw-craw*.

The most important of these parasites is the *filaria nocturna*. The adult form of this organism was not discovered until 1876. On December 21st of that year Bancroft, of Brisbane, Australia, found the female worm in a lymphatic abscess of the arm. In July, 1877, this fact was announced by Cobbold¹⁵ in the *Lancet*. Cobbold named the parasite the *filaria Bancrofti*, in honor of the discoverer.

Filariasis is widely distributed throughout tropical and subtropical countries. It occurs in a large part of China and India, in Japan, Australia, and the South Sea Islands. Thorpe¹⁶ has shown that 32 per cent. of the inhabitants of the Friendly Islands are affected. Strube¹⁷ found the embryos in the blood of negroes from the Transvaal. The disease occurs in Spain, and is very common in Brazil and the West India Islands. Guitéras,¹⁸ in 1886, called attention to the existence of the disease in the Southern States. He found four cases in Key West and one in Charleston, S. C. De Saussure,¹⁹ in 1890, published a report of twenty-two cases he had observed in Charleston. The city had been in constant communication with the West Indies, and doubtless the disease was introduced into this country from those islands.

Filariasis occurs particularly along the Gulf and South Atlantic coast. Many of the cases have been imported into this country, but in 1888, Mastin²⁰ reported an indigenous case in Mobile. De Saussure's twenty-two cases were of this nature. Slaughter²¹ recorded, in 1891, two cases indigenous to the northern part of Virginia. Dunn²² recently

found the filaria embryos in a woman who had always lived in Pennsylvania.

So far as we know, the adult worms have never hitherto been found in this country.

SPECIMENS OF ADULT FILARIA BANCROFTI PREVIOUSLY FOUND.

Bancroft, in a letter to Cobbold,²³ dated from Brisbane, Queensland, April 20, 1877, said: "I have now obtained five specimens of the worm. . . . The worm is about the thickness of a human hair, and is from three to four inches long. My first specimen I got on December 21, 1876, from a lymphatic abscess of the arm--this was dead. Four others I obtained alive from a hydrocele of the spermatic cord, having caught them in the eye of a peculiar trocar I use for tapping. These I kept alive for a day, and separated them from each other with great difficulty." The worms were preserved in glycerin and sent to Cobbold, who described them. They were all females; only one of them was tolerably perfect.

On August 7, 1877, Lewis²⁴ found in a blood-clot from a lymph scrotum, after a continuous search for eight hours, portions of a male and a female worm. The male worm was torn across in two places, and the terminal ends were missing, and the tail of the female could not be found. The male was twisted about a portion of the female and was separated only with difficulty.

On November 12, 1877, dos Santos,²⁵ in Brazil, found five adult females in a lymphatic abscess of the arm; only one worm was complete.*

In 1881, Manson,⁹ in Amoy, China, opened an abscess of the thigh, and, by passing a needle rapidly through some dark, grumous clots that escaped with the pus, succeeded in finding three or four fragments of a female worm.

In the same year he found a female filaria in a dilated lymphatic in a case of lymph scrotum. On attempting to withdraw it the body snapped across. The specimen of lymph scrotum, with half the worm *in situ*, was shown at the London Pathological Society.

In 1888, Sibthorpe,²⁶ of Madras, India, found two worms—a male and female—upon the cut surface of a lymph scrotum. The specimens were studied by Bourne. The tail of the female was wanting. The male specimen was about an inch and a quarter long (3.1 cm.). The anterior extremity was not present. The male worm showed a great tendency to coil.

* We doubt somewhat whether the filariæ which dos Santos found belonged to the species under consideration. His description does not conform with that of the filaria Bancrofti in all details. In deference to the opinion of such an authority as Cobbold,²³ however, we have included this case.

In 1904, Maitland¹⁵ of Madras, India, removed some thickened tissue from the inner surface of the left upper arm of a man who a month before had suffered from lymphangitis in that region. Two operations were performed. The tissues removed were macerated in a mixture of citric acid and chloroform of equal parts. In the lump first removed were white worms, and in the second one were found. Three of these were males and five females. "These first discovered were coiled up together in a mass, and appeared as if lying in a lymphatic channel, but owing to the maceration of the tissues it was difficult to be certain of this. . . . An interesting point in the case just related is the great number of the parasites that were found, and also the fact that they appeared to be all intimately associated with one another. So far as we know, such a large number of these parasites have never before been found in one individual, nor have they been found coiled together in one mass as a number of these were." Maitland mounted six of the worms in balsam and sent them to Manson, who described and identified them. The tails of two of the females were missing, but the three males were complete.

Huber¹⁶ states that Czerny found a living female filaria in the ovary of a woman from Rio de Janeiro. In 1897, Young,¹⁷ in London, removed a hard, nodular mass from the arm of a young sailor, a native of Jamaica, who had lived in the West Indies, the United States, and Canada, who suffered from lymph scrotum and varicose groin glands. After several hours' examination of the tissue he noticed lying across his forefinger "a long white thread about the size of a horsehair." It proved to be a female filaria. Later the man committed suicide. An autopsy was performed. From a cut in a lymphatic of the right groin a small bundle was seen to emerge, looking like a tiny coil of very thin catgut. This was unravelled in normal saline solution and proved to consist of heads and part of the bodies of three female filaria Bancrofti. In the lymphatics of the right spermatic cord six more female worms were found, all more or less mutilated in the dissection. In the left spermatic cord seven worms were found. One of these was a male; it was an inch and a half long (3.75 cm.). It was in four pieces, and the tail was not discovered. Thus, in all, seventeen worms were obtained. Only one of these was a male.

In the case here reported nine worms were found in the lymphatics of the epididymis. Two of these were males. One of the males and one of the females were complete. The others were more or less mutilated.

Altogether we have collected eleven cases in which the adult filaria Bancrofti was discovered. In these cases fifty-one specimens of the worm have been found and studied. Forty-three were females; eight were males. The worms have rarely been found intact and complete.

Lewis, in 1877, was the first to discover the male. Both the tail and the head were missing in his specimen. Sibthorpe found the male again in 1888. The tail was present, but the head was gone. Maitland, in 1894, obtained three complete males. Young, in 1897, found a mutilated specimen. In our case two males were found, one of which was uninjured.

LOCATION. The worms have been found three times in a lymph scrotum (Lewis, Manson, Sibthorpe). Once in hydrocele fluid (Bancroft). Once in the epididymis (case reported by the writers). Once in the ovary (Czerny). Once in the spermatic cord (Young). Four

FIG. 3.

Adult male *filaria Bancrofti*. Magnified 10 diameters.

times in the arm (Bancroft, Maitland, Young, dos Santos). Once in the leg (Manson). Thus we see that in seven of the eleven cases the worms have been found in close relation to some part of the generative system.

In 1886, Magalhaes,²⁰ of Rio de Janeiro, found two adult worms—a male and female—in the left ventricle of the heart. He regarded them as *filariæ Bancrofti*. They are twice as long as the *filaria Bancrofti*, and differ in structure. Unfortunately, the description of Magalhaes *filaria* has crept into some of the best text-books of helminthology and medicine under the heading of the *filaria Bancrofti*.

DESCRIPTION OF THE ADULT WORMS. The male worm is shorter than the female. The intact specimen is shown in Fig. 3, magnified

ten times the natural size. The tail has a tendril-like twist, and the end is rounded and blunt. The worm is 3.86 cm. long; the body is 0.120 mm. in diameter; the head, 0.051 mm.; the neck, 0.043 mm.

The female measures between 7 and 9 cm. in length. The anterior extremity is tapering, but under the microscope the head is seen to be somewhat club-shaped. The mouth is unprovided with papillæ. A transverse section of the head and neck resembles somewhat the shape of a Maltese cross. (Fig. 4.) The diameter of the head is 0.068 mm. The diameter of the neck 0.051 mm. The diameter of the worm is greatest near the middle of the body, where it measures 0.240 mm.

FIG. 4.

FIG. 5.



FIG. 6.

oesophagus

FIG. 7.

uterus,
containing embryos.

Cross-sections of an adult female *filaria Bancrofti*. Highly magnified.

Fig. 4, head. Fig. 5, body, 0.64 mm. from anterior end. Fig. 6, body, 1.26 mm. from anterior end. Fig. 7, body, anterior to bifurcation of uterus.

The surface is slightly irregular. During life transverse striations or corrugations were visible. These were probably caused by contractions of the subjacent muscular wall. The mouth is situated in the centre of the anterior end. (Fig. 5.) The vagina opens near the head, the distance varying from 0.72 mm. to 1.3 mm. in different specimens. (Fig. 6.) The anal orifice is near the tip of the tail, which is rounded and blunt.

The anatomy of the worm is best studied in serial sections. Portions of different worms were embedded in celloidin. Transverse sections were cut and stained with hæmatoxylin and eosin. The digestive tract

passes down in the centre of the worm until the vagina is reached. The two tubes then run side by side. Lower down the greater part of the worm is occupied by the uterus, and the digestive tract is situated in the musculo-cutaneous wall. (Fig. 7.) The vagina is 2.4 mm. long, and has a thick, homogeneous wall. The uterus is composed of two thin-walled tubes which unite anteriorly. These tubes and the digestive canal are intertwined so that they have a braided appearance. The uterine tubes are of equal size, thin and structureless. The digestive tube appears about one-third the size of the uterine tubes in the fresh

FIG. 8.

Portion of an adult female *filaria Bancrofti*, showing the digestive tract and the two uterine tubes extruded from the cut end. Magnified 36 diameters.

specimen, and presents a granular appearance. The uterine tubes (Fig. 8) are filled with ova and embryos in various stages of development. The ova average 0.035 mm. in size. The smaller embryos are coiled up and surrounded by a thin, structureless membrane—the chorion—and measure 0.050 to 0.060 mm. in their long diameter.

Manson found that the females were brown, while the males were colorless. The specimens, however, upon which he based this statement had been removed from tissues macerated in a mixture of nitric acid and chlorate of potash and then mounted in Canada balsam. All our worms were white and opaque and resembled white threads. But we

have noticed that when portions of the female worms were placed in impure alcohol, or salt solution, or became somewhat dried, that the walls of the uterine tubes assumed a brownish hue, giving the worms the appearance described by Manson.

Bourne,³¹ and later Manson, showed that the tail of the male is provided with two spicules, which are retracted within the cloaca. In our complete worm, owing to the coiling of the tail, it was not possible to demonstrate the presence of these spicules without danger of mutilating the specimen.

Some authors lay stress upon the fact that the males show a great tendency to become coiled. This is doubtless true. But the female worms also may twist themselves into inextricable coils.

PATHOLOGICAL CHANGES IN THE TISSUES. Tissues were hardened in Zenker's fluid and in 10 per cent. formalin. The greater part of the wall of the thickened lymphatics is composed of muscle tissue. This is beautifully shown in preparations stained with Mallory's connective-tissue stain. The endothelium appears normal. Between it and the muscle tissue is a layer of connective tissue, and surrounding the groups of muscle bundles are large bands of connective tissue which pass from the intima to the adventitia. There are no areas of degeneration.

Sections stained with Weigert's elastic-tissue stain show many delicate elastic threads surrounding the muscle bundles. In the intima is a marked new formation of elastic tissue. The elastic fibres are arranged in loops extending from the media to the endothelium of the intima.

We have seen a similar process of muscular hypertrophy in the dilated and thickened veins of varicoceles. Soboroff,³² many years ago, stated that he observed a constant hypertrophy of the muscle fibres of the media in varicose conditions of the veins. But the remarkable muscular hypertrophy that occurs in many cases of varicocele has received but little attention from recent writers. The new formation of elastic tissue in the walls of the lymphatics is analogous to that recently described by Janni³⁴ in varicose veins.

Although all parts of the testicle, epididymis, and spermatic cord were examined histologically, the adult worms were found only in the body of the epididymis.

Sections through the tissue upon which the mass of adult worms had been discovered showed portions of one or more female worms lying in large lymphatic spaces five to ten times the diameter of the worm. The small digestive tract and the larger uterine tubes are readily demonstrable. There are no signs of inflammatory reaction in the walls of the lymphatics that contain the worms.

In some of the lymph vessels are embryo filariæ. Throughout the fibrous tissue between the lymphatics are numerous foci of lymphoid cells. It is interesting to note in this connection that Dr. Steensland

found an increase in the number of small lymphocytes in each of the three differential blood counts that he made.

One large lymph vessel is almost completely obliterated by a mass of granulation tissue, in the interior of which are apparently two portions of an encysted necrotic worm. (Fig. 9.) With the exception of a clear zone immediately around the worm the ingrowth is densely infiltrated with lymphoid cells and eosinophiles.

A search of the literature reveals only one case in which an adult filaria has been found in the tissues on histological examination.

FIG. 9.



Large lymphatic vessel nearly occluded by an ingrowth of granulation tissue and containing two portions of an adult filaria Bancrofti. Magnified 38 diameters.

Marie²² discovered a dead female worm in an inguinal lymph node removed from a man affected with filariasis. The worm was surrounded by pseudotuberculous tissue.

Our observation explains one method by which the large lymphatic vessels may be occluded and lymph stasis produced. A worm dies and gives rise to a thrombus, which, as a rule, probably only partially blocks the vessel, as the lumina of the dilated lymphatics are many times the diameter of the worm. Later a growth of connective tissue extends from the wall of the vessel into the lumen. It surrounds the dead worm and obliterates the lymph channel.

It is not at all impossible that the lymph stasis may also be produced in other ways. Manson found ova in a lymph node. These he assumed were discharged prematurely from an adult worm, and having a larger diameter than the embryos they would block the minute branches into which the afferent lymphatics break up in the lymph node.

It is known that the worms may live for many years in the body. Our patient left the West Indies four years before the time of operation. Hence, the live adult worms were at least four years old.

DESCRIPTION OF THE FILARIA EMBRYOS. The embryos measure 0.260 to 0.300 mm. in length, and 0.006 to 0.008 mm. in breadth. Their anterior end is rounded. Their tail is pointed. It is enclosed in

FIG. 10.

Photomicrograph of a living filaria embryo in hydrocele fluid. Magnified 250 diameters.

a thin, transparent sheath which is much longer than the worm. Rarely the filaria can be seen moving forward and backward within its sheath. The collapsed sheath extending beyond the head often appears like a single waving cilium lashing the red blood-corpuscles at some distance—0.030 to 0.040 mm.—in advance of the head. The embryos are in constant motion, writhing, coiling and uncoiling, but they never exhibit a true progressive movement. (Fig. 10.)

In the hydrocele fluid many empty sheaths were found after it had stood in the laboratory forty-eight hours. Manson³⁵ produced this ecdysis by cooling blood which contained filariæ nearly to the freezing-point. The embryos have remained alive as long as five days in a cover-

slip preparation of the blood kept at room temperature. They seem to undergo a granular degeneration. Henry³⁶ states that he has kept them alive in a cool room for ten days. In the thermostat at 37.5° C. they usually die in two or three days. When the lashing movements of the body had nearly ceased a peculiar "pouting" movement of the head was observed. Whether this was due to the protrusion of a proboscis or the retraction of a prepuce-like structure, as Manson³⁷ maintains, we were not able to determine. Attached to the tip of the head is a tiny spine. The pouting movement was found to be repeated twenty-eight to thirty times in a minute.

The structure of the embryos was best studied by fixing ordinary cover-slip preparations of the blood by heat or by a saturated solution of corrosive sublimate, as recommended by Plehn,³⁸ and staining for a few seconds with Löffler's methylene-blue or with a 2 per cent. solution of thionin. When stained the body is found to be studded with irregular, deeply staining granules. Near the junction of the middle and posterior thirds of the body is an elongated homogeneous structure of wavy outline. Sometimes it is plainly visible in living embryos. Sometimes no trace of it can be seen.

Flint³⁹ has advocated methylene-blue in the treatment of filariasis, while Laveran and others recommended quinine.

The following experiments were tried with the hydrocele fluid: A drop of hydrocele fluid was mixed with a drop of 1:1000 methylene-blue solution. The filariæ were actively motile after two hours. A drop of quinine sulphate solution, 1:1000, was mixed with a drop of hydrocele fluid. Some filariæ became motionless within a few seconds; all within three minutes. These results agree with those obtained by Laveran.⁴⁰

Neither of our patients was anæmic. The red count in Case I. was about 5,000,000. Lazarus,⁴¹ in his recent work, states that filariasis is the cause of severe anæmia. Doubtless the complications, hæmato-chyluria, chylous diarrhœa, etc., may produce this condition, but the filaria embryos *per se* do not appear to impoverish the blood at all.

CLINICAL CONDITIONS PRODUCED BY THE PRESENCE OF FILARIA NOCTURNA. (The other varieties of filariæ will not be considered in the following pages.)

The presence of filaria embryos in the blood or other fluids of the body is proof of the existence of live parent worms whose habitat is in some portion of the lymphatic system. The duration of life of the parent worm is unknown, hence it has not been determined how long a person may remain a victim of filariasis. Even if the adult worms should die the patient is liable to be reinfected in tropical districts. It is very common for inhabitants of the tropics to harbor the filaria nocturna and yet show no symptoms that would lead one to suspect its presence.

There is no evidence which shows that the parent worms live in other than the lymphatic vessels, or that they migrate from one part of the body to another. The very meagre evidence showing that a subject ever gets rid of the embryos when once infected points to the fact that the parent worms are multiple and abide in different locations. We can find no authentic cases where the embryos have disappeared after the removal of parent worms, which demonstrates that others still remain, although such removal is very frequently followed by complete and permanent relief from all symptoms. Hence, one may be a victim of filariasis and yet not suffer any inconvenience.

So far as known, the embryos do not cause any pathological changes, for their small size enables them to be carried freely throughout the circulatory system.

The parent worms, on the other hand, are capable of producing many different clinical manifestations, consequent, primarily, on obstruction to the lymph circulation. This obstruction is rarely due directly to the worm, but is generally the result of secondary changes which thicken the walls of the lymphatics, and thus narrow their lumen.

Furthermore, the location of the parent worm is frequently the seat of infection, and the presence of an abscess or lymphangitis may be the first warning of any trouble whatever. Manson suggests that the ova are capable of obstructing the smaller lymphatics, and thus he accounts for certain pathological changes.

Hence, the clinical manifestations depend upon lymphatic obstruction, complicated or not by secondary infection.

The symptoms may be :

1. General or constitutional.
2. Local, thus open to wide variations according to the part involved, whether as the result of stasis alone or modified by infective processes.

CONSTITUTIONAL SYMPTOMS. The first warning of the presence of filariæ is often given by the more or less sudden onset of constitutional symptoms before any local signs appear. General debility and fatigue after exertion, and irregular periodical febrile attacks somewhat resembling malaria, are common early symptoms. Pain in the back, pelvis, and groins is frequent, and it may be very acute and accompanied by nausea and vomiting. These attacks are generally relieved by absolute rest, and produced by exertion. Their increasing frequency, together with the appearance of local signs, particularly about the genitals, may be accompanied by severe mental depression, melancholy, and sexual neurasthenia.

When a local area becomes infected with pyogenic organisms the usual constitutional disturbances follow.

In certain mild cases, without local signs, where filariæ have been discovered in the blood, an occasional slight transitory febrile attack

is the only evidence of filarial disease. In other instances the presence of embryos in the blood is the only evidence that apparently perfectly healthy individuals are subject to filariasis.

LOCAL MANIFESTATIONS. Local signs consequent on the presence of filariæ are subject to great variation according to the part affected. They are due primarily to obstruction of the lymphatic circulation, thus causing injury, and secondarily to the invasion of pyogenic organisms. The changes due to obstruction progress slowly.

Filaria nocturna is known to produce the following local pathological changes:

(1) Dilated lymph glands—varicose glands. (2) Dilated lymph vessels—lymphangiectasis, lymphatic varix. (3) Probable rupture of dilated varices, giving rise to chyluria, chylous hydrocele (chylocele), and rarely chylous ascites and chylous diarrhoea. (4) Cutaneous lymphatic obstruction manifested as œdema—lymph scrotum, lymph vulva, and probably elephantiasis Arabum of the tropics (Manson). (5) Results following pyogenic infection—cutaneous lesions, lymphangitis, cellulitis, abscess. (6) Two or more of these conditions may be associated in the same individual.

1. *Dilated Lymph Glands.* This condition is generally associated with dilated lymph vessels running to and from the glands. The glands of the groin are by far most commonly affected, and either the inguinal, femoral, or both may be involved. It is unusual to observe changes in other lymphatic glands.

They increase slowly, and, as a rule, there are no subjective symptoms to attract the attention of the patient until they have attained considerable size. Then there is a feeling of tension and weight. Unless they are inflamed the skin over them is normal and freely movable. The glands themselves are soft, compressible, doughy, and ill-defined, and not ordinarily tender. They decrease in size when the patient is lying down, and slowly refill when he is erect. The collection of glands may be as large as the fist.

There should be no difficulty in differentiating them from herniæ, varicocele, and varicose saphenous veins. They may be aspirated safely, and the fluid will be yellow, white, or reddish, according to circumstances, and will generally contain embryos. The glands themselves consist of a dilated meshwork containing channels or cavities filled with lymph. Infection with pyogenic organisms gives rise to adenitis and peri-adenitis, which may result in abscess formation.

2. *Dilated Lymph Vessels (Lymphangiectasis).* There are occasionally to be seen on the surface of the skin minute lymphatic dilatations. These may suddenly disappear or they may rupture and allow the escape of lymph. The larger lymphatic trunks under the skin are usually associated with dilated lymph glands. The case here reported

would seem to be somewhat unusual, for the glands of the groin were normal, but the lymphatics of the cord were much dilated and thickened, as described above. The lower end of these lymphatic trunks was continuous with the lymphatic dilatations in the testis. In all probability there are points of obstruction in the pelvic lymphatics of this case, which condition alone would seem to account for the dilatation throughout the cord. Clinically the condition resembled that of varicocele.

When infected, a lymphangitis results which is manifested by the usual red streak and indurated cord and the ordinary constitutional reaction. Infection of the cutaneous lymphatics is common in lymph scrotum and elephantiasis.

3. *Rupture of Dilated Varices.* (a) Chyluria. This is one of the commonest signs of the presence of filariasis. It may be of sudden onset, and be the first warning of any trouble, or it may be preceded by obscure pains in the lower abdomen and pelvis. Although its appearance is of comparatively sudden origin, it is the result of a chronic process, which has probably existed for months and even years. It is probably the commonest external manifestation of the presence of filariasis, and it is less apt to be associated with other varieties of external changes.

It is probably due to the rupture of dilated varices into some portions of the urinary tract, either the bladder or the kidney. Autopsies on such patients show that the abdominal and pelvic lymphatics may be enormously dilated, thereby obscuring some of the retroperitoneal structures. As a result of such ruptures the contents of the lymphatics is poured into the urinary tract, so that the voided urine contains its normal constituents unaltered in addition to the lymph. The appearance of the urine will vary according to the character of the lymph, but it is generally turbid. It is apt to be milky-white soon after the process of digestion has commenced on account of the excess of fat, but later it is paler on account of the more serous character of the lymph. The urine may become clear suddenly, or remain chylous for weeks and months, then become normal, and remain so permanently, but the chyluria is more apt to recur at some later period. Lanceraux⁴² records a case where it persisted fifty years.

In addition to the unaltered normal constituents, the urine contains the products of the lymphatics. It is uniformly turbid when voided, but soon separates into three more or less distinct layers. The great bulk of the urine remains rather uniformly turbid on account of the divided fat globules, but on the surface is a yellowish layer due to larger collections of fat, and on the bottom of the glass are clots of fibrin often discolored with red blood-corpuscles. Hemorrhage is so striking in some cases that the condition is often called hæmatochyluria.

These clots not infrequently form in the bladder and cause temporary obstruction. The urine becomes clarified when shaken with ether. The microscope may show the presence of active embryos.

Although chyluria is the result of a very chronic process, there are certain recognized exciting influences which cause the dilated lymphatics to rupture. Thus chyluria may appear in women after parturition and in men after violent exercise. Like all inaccessible varices, these must be left to take their course.

Chyluria is not directly dangerous to life, but an excessive loss of chyle may cause debility and worry on the part of the patient, may result in mental depression so as to incapacitate him for all sorts of active work. The obscure pains in the back and pelvis are probably due to the overdistended lymphatics.

(b) Chylous hydrocele. This complication is the result of obstruction of lymphatics, so that the chyle is poured into the tunica vaginalis testis. In the case which is here reported the "chylocele" appeared for the first time after the primary operation at which the dilated lymphatics of the cord were excised. This prevented the normal return of the lymph from the testis which was provided for by these dilated channels in spite of partial obstruction of the lymph current. The accumulation began at once after these vessels were ligated. The presence of numerous parent worms in the vicinity of the testis was undoubtedly the cause of this excessive escape of lymph, for this operation was practically the one employed in the radical cure of varicocele, which is not often followed by an acute hydrocele.

The physical signs of chylous hydrocele do not differ from those of an ordinary hydrocele. So far as we could determine, the translucency was nearly as pronounced. Knowing what we did in reference to this case, the cause of the fluid accumulation was obvious, but under other circumstances, aspiration and microscopical examination will determine the condition. The character of the fluid in chylous hydrocele has already been described.

The association of a scrotal tumor with varicose lymph glands or other varices should make one suspicious as to its nature. In patients who have visited the tropics any turbid hydrocele fluid should be subjected to microscopical examination in order to determine the diagnosis.

In cases of chylous hydrocele it is probable that parent worms are present in the vicinity of the testis, and on more than one occasion these worms have been recovered from the fluid. Our case demonstrates the value of radical interference. In sixty-two cases of filariasis reported by Manson there were six cases of "chylocele."

These cases may become infected and manifest the usual signs. A lymph scrotum is not an unusual sequence if they are left to take their course.

(c) Chylous ascites is probably a frequent complication where the abdominal lymphatics are involved, although there is but little evidence, clinical or pathological, to confirm this statement. The peritoneum would probably absorb the escaped lymph, and no harm result. In the tropics the presence of turbid fluid, which could not otherwise be accounted for, should make the surgeon suspicious as to its character.

(d) Chylous diarrhoea is a rare complication.

4. *Cutaneous Lymphatic Obstruction.* (a) Lymph scrotum is the result of obstruction in the lymphatics of the integument, and is usually accompanied by other external signs, most commonly by dilated lymph glands. The skin of the scrotum is permanently thickened, but its surface remains intact for a period at least. Vesicles and small varices may appear on the surface, and these may rupture later and allow the escape of lymph. Its color will vary according to circumstances, and the amount may be considerable. Inflammatory changes generally follow, and thus the surface of the scrotum may become eczematous and ulcerated, or cellulitis and abscess may appear in the deeper layers. Thus the scrotum becomes permanently enlarged and resembles true elephantiasis.

(b) The changes in lymph vulva are analogous to those in lymph scrotum.

(c) Elephantiasis Arabum (tropics).

It is still a disputed question as to whether this condition is a manifestation of filariasis, but Manson offers many convincing arguments in support of this theory. If such is the case, then elephantiasis is the commonest manifestation of the presence of filaria. This question will not be considered here.

5. Results following pyogenic infection: Cutaneous lesions, lymphangitis, cellulitis, abscess.

Many of these conditions have been considered.

It is not unusual, however, for a patient to present himself for treatment on account of an attack of lymphangitis or abscess, more particularly on the extremities. There is often the history of a trauma.

Adult worms have been found in these lymphatic abscesses, after the removal of which local recovery follows, but in no case, so far as we can learn, have the embryos permanently disappeared from the blood, showing that parent worms have always existed elsewhere.

Ordinarily a dead worm probably becomes encysted, as demonstrated in our case; but if infection should take place, lymphangitis or abscess is the usual course, and the dead worm may be discovered in the pus. These local signs of infection may be the only external evidence of anything wrong with the patient, but an examination of the blood may reveal the presence of the embryos.

6. That two or more of the above conditions may be associated in

the same individual, accompanied or not by secondary inflammatory changes, need not further be discussed.

COURSE AND PROGNOSIS. Cases of spontaneous recovery are recorded. There are no recorded cases, so far as we know, where operation has been followed by the permanent absence of embryos, although it is common for such patients to be permanently relieved of further objective and subjective symptoms. The length of life common to the parent worm has not been established, but if the patients should not be exposed to later invasion, in all probability the parent worms would die in time, and no further embryos appear. Much of the damage, however, sustained by the lymphatics can never be repaired. Most of the cases which have been studied thus far have continued to dwell in the tropics and are thus exposed to secondary invasion.

In many cases the parent worms reside in inaccessible lymphatics, and, therefore, cannot be reached, and the case must be left to take its course. In other instances the parent worms are accessible to the surgeon, and their removal is often followed by great benefit and sometimes apparent recovery, as in our case, although a few embryos still exist, showing that he still harbors more parental forms. In all probability the number of embryos present is a fair guide as to the number of parent females. The embryos may be too few to be detected by casual examination. Many subjects of filariasis escape without any symptoms, and the embryos themselves do no harm so far as is known.

Filariasis, when due to the *filaria nocturna*, runs a chronic course and is not a direct danger to life. Fatal issues have generally followed some intercurrent infection.

Certain local manifestations can be permanently relieved by surgical measures.

PROPHYLAXIS. Filariasis cannot be transmitted directly from one person to another, for the embryos require an intermediary host before they can develop into adult worms. It seems to have been demonstrated beyond question that certain species of mosquito act as this host, and that the young *filariæ* continue their existence in water, and are thus taken into the system.

In filarial districts all sources of drinking water should be protected from mosquitoes. Cisterns and wells should be kept covered. The only safe precaution is that all drinking-water should be either filtered or boiled, and at some future time the filtration of the municipal water-supply may be demanded. Reservoirs should be cleaned often and regularly. It is never safe in such districts to drink from open streams and pools.

Our patient states that it is customary for the white population of Barbadoes to drink only filtered water, but that he and his brother were in the habit of drinking from any pool while on hunting trips.

In a moderate degree subjects of filariasis are a danger to a community.

TREATMENT. Where the presence of embryos alone is the only sign of filariasis no treatment is necessarily called for in order to relieve any symptoms, but, furthermore, there is no known method whereby such embryos may be removed. On the other hand, the embryos *per se* are harmless so far as is known. All treatment, therefore, to be of any permanent value, must be directed toward removal of as many of the parent worms as possible. In that the lymphatics most commonly involved (pelvic and abdominal) are not readily accessible, and the exact location of the parasites is difficult to determine, these cases are best treated by allowing them to take their course; but if secondary complications follow, then surgical measures may be of great service.

MEDICINAL TREATMENT. There are at present no known drugs, when administered to the patient, which have proved to be of value in killing the adult worms. It is the custom in filarial districts to administer large doses of quinine. Although weak solutions of this drug will kill the embryos outside of the body, its administration seems to have no effect on them in the circulation, and their persistence shows that it is not capable of killing the adults. Its use, however, is probably of value in counteracting some of the secondary constitutional symptoms.

It is not improbable that local injections of certain antiseptics might serve to kill the parent worms if they could be located. Even then only certain regions would be accessible to such treatment.

OPERATIVE TREATMENT. As a general rule, operative treatment is of value only in relieving certain local conditions. If the site of such local condition should happen to be accessible to the surgeon, and to be the only nidus of adult worms, then operation might be curative; but, unfortunately, this must be a rare circumstance. These facts do not contraindicate operation.

The immediate indication for operation is generally some local result of lymphatic obstruction, complicated or not by secondary infection. During the dissection of these wounds there may be considerable escape of lymph, so that it is wise to ligate all lymphatic vessels carefully. The oozing of lymph can otherwise be controlled by packing and pressure. Such wounds generally heal in the ordinary manner. Local recurrences are unusual.

TREATMENT OF AND OPERATIONS FOR SPECIAL COMPLICATIONS.

1. *Dilated Lymph Glands.* These glands are usually part of a large varix, and if they are small and do not cause any inconvenience, it is wise not to interfere. If they are large enough to cause discomfort, or if they are the seat of recurring inflammatory processes, it is advisable to excise them.

Such excisions have been followed by chyluria and elephantiasis of the leg, but this does not necessarily prove that these are direct results.

2. *Lymphangiectasis*. Dilated lymph varices are usually associated with other neighboring complications and should be treated simultaneously. Dissection should be as complete as possible and both ends of large vessels ligated.

3. *Chyluria* is considered to be the result of rupture of varices which are practically inaccessible, so that such cases are not suitable for operation. The patient should be put to bed and the hips elevated in order to reduce the hydrostatic pressure. The diet should be restricted, and the fat elements withheld so far as possible. Cathartics and diuretics are valuable in order to relieve the tension in the lymphatics, and thus allow the rupture to close. Otherwise the case must be left to take its course.

4. *Chylous Hydrocele* is simply a collection of lymph in the tunica vaginalis testis. In our case many parent worms were lodged in the testis, and at the same time the lymphatics of the cords were much distended, and thus extended into the abdominal cavity, showing that pelvic obstruction must exist.

In such a case simple incision or the injection of irritants would not cure a hydrocele, nor would it be practicable to attempt to dissect out adult worms from the lymphatics about the testis. Operation must be radical, and it would seem to be wisest to excise the testis and the cord as high as possible. In this case the local cure was prompt, uncomplicated, and thus far it has remained permanent.

The rare complication of chylous diarrhoea should be treated by rest and on general principles.

Chylous ascites would probably be recognized only in the course of a coeliotomy for some intercurrent cause.

5. *Lymph Scrotum*. The scrotum should be kept scrupulously clean and dry; it should be powdered, protected, and suspended. By this means infection may be avoided for a time. When its size makes it troublesome, or if it is the seat of recurring attacks of inflammation, then it should be excised. Margins of healthy skin should be left and the testicles need not be sacrificed. Flaps of skin may be obtained from the thighs, if necessary, to cover in the wound.

6. *Elephantiasis* is a condition which is permanent and tends to increase. Ninety-five per cent. of the cases involve the leg. In the early stages the process may be retarded by the use of elastic bandages, careful massage, and resting the part as much as possible. Its progress is usually slow unless the surface becomes excoriated and infected, when secondary symptoms and changes set in. In the tropics the part should be protected from the hot sun, and the leg should be kept dry. Occasionally excision of strips of skin may be of palliative value, but at times the condition of the leg may be such that only amputation will

give relief. Most cases of elephantiasis are troublesome on account of the secondary inflammatory processes.

Elephantiasis of the scrotum may follow a lymph scrotum and reach enormous dimensions. Removal by operation is the only method of relief, and this may be performed with comparative safety.

Elephantiasis elsewhere has been rarely subjected to surgical intervention.

7. Infective Complications Associated with Local Filarial Lesions. These complications are very common and may be manifested as erysipelas, lymphangitis, cellulitis, and abscess. Constitutional symptoms, often severe, are present at one time or another. The ordinary methods of treating infected wounds should be made use of according to circumstances. After the acute process has subsided the various local lesions may be treated in a radical manner as described above.

Comparatively few operations have been performed for filarial processes, and most of these have been carried out in the tropics, notably at the Madras Hospital, India, where many of the results have been excellent.

We take this opportunity of expressing our thanks to Dr. Councilman and to Dr. Mallory for advice and assistance; to Messrs. Brinkerhoff and Richardson, of the Harvard Medical School, for the excellent photographs, and to Miss Jones and Dr. Howe for the drawings.

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RECURRENT VOMITING IN CHILDREN. (CYCLIC VOMITING.)¹

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THE following case-histories illustrate a condition which seems well worthy of a more extended consideration than has been devoted to it hitherto. The first case is an instance of the disease in a mild form and,

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in a way, on the border line. The second is one of unusual severity, and shows how severe the disease may become. The third and fourth go still further, since both the children died.

CASE I.—Marcellus H., born January 5, 1895. In infancy his digestion was feeble and vomiting occurred frequently. After July, 1895, his general health suffered through failing appetite and increasing indigestion. The latter was frequently present in the winter of 1895–96. Later health and digestive power improved. There was irregular fever during most of the summer of 1896, and again in the summer of 1897, when he was under my care, and to less extent in that of 1898. The fever seemed to be the result of chronic auto-intoxication of intestinal origin, although there were few evidences of indigestion, and vomiting was unusual.

Up to this period in his life the occasional vomiting had been apparently clearly the result of acute indigestion. Now, however, he began to have certain severe attacks of vomiting of the type presently to be described, which seemed entirely unassociated with any indiscretion in diet or symptoms of indigestion. These attacks occurred about every three or three and a half weeks, and continued to appear until early in the spring of 1899, when he again came under my care. I saw him in March, 1899, at the beginning of one. Since this time he has had but one slight attack. The nature of an attack was much as follows: The child would be apparently well and lively for some weeks. Then, without discoverable cause, or any decided symptoms of indigestion, he would lose his appetite for a few days and become constipated. High fever then developed, and vomiting soon began. The latter lasted during one or two days, and occurred frequently, especially if anything was put into the stomach. Fever abated after vomiting commenced. There were decided prostration, restlessness, rapid respiration, much thirst, and retracted abdomen. Complete loss of appetite continued. Loss of flesh was rapid. Constipation was present during the attack, but could be overcome by purgatives, although with some difficulty. Its relief was sometimes accompanied by relief of the vomiting; but in other attacks, where no purgatives or enemata were given, vomiting ceased before the bowels were opened. There was, in fact, no clear connection between the relief of the constipation and the cessation of the vomiting. The urine was sometimes diminished in amount before the attack, and during it it remained scanty. The urine obtained on March 18th, at the beginning of convalescence, contained a large deposit of crystals of uric acid. Analysis made by Prof. John Marshall, of the University of Pennsylvania, gave a ratio of uric acid to urea of 1:116. A specimen passed on May 26th, at a time when the child was in excellent health, still showed a diminished excretion of uric acid. Convalescence from the attacks was rapid. The early evacuation of the bowels, an almost total withdrawal of food, and the administration of small doses of a bromide salt with a febrifuge appeared to abbreviate the attacks.

CASE II.—Henry A., born May 12, 1891. He had always been a nervous, but otherwise healthy child. His first attack of recurrent vomiting took place in July, 1894; the next two in January and in December, 1895. These earlier seizures lasted about one day, not often longer. Constipation was not noticed, if present. The vomiting was

severe, but not alarming; it was not connected in any way with the diet or attended by indigestion. There was always restlessness, sighing respiration, and tonsillitis. Recovery was rapid unless tonsillitis had been severe. The first truly alarming attack, which was nearly fatal, took place in March, 1897. He had mild seizures in January, 1898, and in May, 1898. A second severe attack occurred in July, 1898. There has been no recurrence.

The two severe attacks must be described somewhat in detail. The first commenced about March 31st with severe vomiting. Very soon this symptom became grave. It was almost continuous, everything which went into the stomach being promptly ejected, and efforts at vomiting occurring frequently, even though nothing was taken. The bowels had been obstinately constipated, in spite of purgatives and of large enemata frequently given, and the attending physician feared intestinal obstruction. I saw the boy late on April 2d. On this date for the first time a bowel movement had been obtained, yet without relief of the gastric condition. Prostration was extreme; there was great restlessness and also much thirst. The respiration was accelerated and sighing, especially when he was asleep. The child slept only fitfully and after an attack of vomiting, soon rousing, tossing, and suffering another attack. There was no pain, tenderness, or retraction of the abdomen. The secretion of urine was diminished. All treatment had been unavailing, including the administration of chloral and bromides by the bowel, and the prognosis seemed most grave. I advised the giving of morphine by hypodermatic injection.

I learned the following details later: The morphine was not given. Vomiting continued, and the exhaustion increased until finally the child lay helpless on his side, while every few moments a little dark or blood-stained fluid ran from his mouth, forceful vomiting being no longer possible. Constipation was now absolute. Another consultant was called, and various drugs were administered, but without benefit. At last, after several more days had elapsed, with the death of the child apparently certain and not far distant, the attending physician in desperation began narcotizing him with morphine in the way suggested. The good effect was immediate, the vomiting ceasing at once and permanently. Within twenty-four hours the bowels were opened by enema, and an uneventful convalescence was established.

In the attack of June, 1898, the child had been ill for one or two days before I saw him. Very little urine had been voided, and constipation had been absolute. There was no great prostration. The attending physician had wisely refrained entirely from feeding by the mouth, and the bowel had been used for nutrient enemata only, without any effort to produce a stool. Apparently as a result of this conservative treatment the vomiting was already better when I arrived. There had been no abdominal pain, tenderness, or retraction. I continued nutrient enemata, and gave Rochelle salts in small repeated doses by the mouth. Vomiting did not recur, and in about twelve hours sighing respiration and restlessness ceased, the bowels were freely opened, and appetite returned. Convalescence was rapid.

The vomited matter in this case was never especially sour. There was never any peculiar odor to the breath. The urine was generally and sometimes greatly diminished before an attack. This scanty secretion continued during the attack. No albumin was found at any time.

The parents, who are most intelligent and observing, could never trace any connection between evacuation of the bowels by purgatives or enemata and cessation of the vomiting. On the other hand, they have found that the chief or only premonitory symptoms were a congestion of the head and a scanty urination; and they have thought that a threatened attack could be prevented by prompt drainage of the system through the bowel, the flushing of the kidneys by large draughts of water, and withdrawal of all food except milk.

For the notes of the following case I am largely indebted to Dr. Alexander Marcy, Jr., the attending physician. I saw the boy in one of the attacks occurring in the spring of 1896.

CASE III.—A. H., born August, 1891. He was a healthy child until the age of nearly two years, except for the occurrence of gastro-enteritis with meningitic symptoms at fourteen months. In June, 1893, he had his first attack of recurrent vomiting, which lasted only a few days, and was supposed to be ordinary indigestion. A second severer attack occurred in February, 1894, another slight one in July, 1894, a quite severe one in February, 1896, two seizures in March, 1896, in May a desperate one, which lasted eight days, and in July, 1896, one which lasted ten days, in which his life was despaired of. The final attack occurred in October, 1896, lasted but two days, and terminated fatally.

The symptoms in all the attacks but the last were much the same. After some loss of appetite, coating of tongue and malaise during the day, vomiting came on suddenly, generally at night. This soon became obstinate and occurred every few minutes, the vomited matter being at first the ingested food, and later mucus and bile, sometimes with streaks of blood. There was great restlessness, continued tossing, and but little sleep. The pulse grew rapid and weak, and respiration irregular and sighing. The temperature was always elevated on the first day. After this it sometimes fell below normal, to rise to fever heat later; sometimes it continued elevated throughout the attack. Normal stools occurred at first, either spontaneously or by enema. Later, after twenty-four to forty-eight hours, the bowels were obstinately constipated, and peristalsis seemed to be arrested. When the attack was over the bowels would move of themselves. Slight abdominal pain was always present. Thirst was intense. The breath had often a peculiar odor. The urine was apparently increased in amount at first, acid, and of high specific gravity, but after one or two days it became scanty, and later even almost suppressed. Indican was present in considerable quantities at first; later acetone appeared. Albumin was absent. Exhaustion finally became extreme, the eyes sunken, and the whole body shrunken, dry, and cold. The mind was always unaffected. Gradually the vomiting became less frequent, restlessness diminished, and recovery began and advanced, usually with rapidity, but slowly after the severest attacks. During convalescence there was often considerable general pruritus.

The last attack differed somewhat from the others. Vomiting was less frequent, but unusually violent, and in a few hours the child was vomiting blood. After twenty-four hours the urine contained albumin, casts, and blood. Death followed from cardiac failure.

Hypodermatic injections of morphine or the administration of chloral and bromides appeared to be of slight service in some attacks, but generally were of no avail.

The following case likewise occurred in the practice of Dr. Marcy. I saw the child in one of the attacks and on a number of other occasions, both when well and when seizures seemed to be threatening.

CASE IV.—Honorina H., born March 2, 1892. She had been a healthy child up to the age of about three years, when she began to have attacks of vomiting, which developed suddenly, were attended by fever, lasted a short time, and were supposed to be due to indigestion. In September, 1895, she had a much worse seizure, which lasted a week. Exhaustion at this time was so great that recovery was despaired of. The next occurred in July, 1897, and another in August, 1897, this being the worst yet experienced, and lasting eight days, during most of which time death was momentarily expected. I saw her for the first time on October 1, 1897, when she was apparently well. After this, during the early part of October, she appeared often to be on the brink of an attack, but none occurred, and the child's general health became good until February 21, 1898. On this date, after about a week of premonitory symptoms, vomiting began, and continued nearly constantly for twenty-four hours. It then lessened somewhat, but soon returned in force. I saw her about the 26th, and found her exhausted and with vomiting still very frequent, although apparently lessening. A few days later she was seen by a prominent surgeon of Philadelphia, who inclined to the diagnosis of appendicitis, but believed that operation was not justifiable, as recovery seemed impossible. She did, however, recover. About a week after convalescence she suffered for a time from diffuse severe articular pains, later changing into mere stiffness, but unattended at any time by swelling of the joints. She was later, when in good health, re-examined by the surgeon, who diagnosed chronic appendicitis, and urged operation. The appendix was removed in April, 1898. Macroscopical examination showed no material change. Microscopically there were slight evidences of inflammatory alterations. After the operation improvement in health continued and was ascribed in part or wholly to the removal of the appendix; but in March, 1899, she had another attack of vomiting, worse than any previous one, and she died exhausted after an illness of nine days.

Autopsy showed necrotic changes in the mucous membrane of the stomach and intestines, slight parenchymatous alterations in the pancreas, spleen, and kidneys, and fatty infiltration of the liver.

The symptoms in this case were in most respects identical with those described in Case III. There were the same uncontrollable, frequent vomiting, loss of appetite, restlessness, sighing respiration, rapid pulse, and inconsiderable abdominal pain and tenderness. The secretion of urine was affected in the same manner, indican and acetone being present as in that case. In contrast, however, although the onset was sudden in some attacks, in others the prodromal symptoms lasted longer, coated tongue, loss of appetite, and restlessness continuing for several days. Pruritus during the attack was more marked. Toward the end of the fatal attack albumin and casts appeared in the urine.

Repeated examinations of the urine were made for me by Prof. John

Marshall, but the results were only partially satisfactory, owing to unavoidable circumstances. Examination on October 16, 1897, when the child exhibited what appeared to be prodromal symptoms, but which, however, did not advance further, showed neither indican nor acetone. On December 2, 1897, the child being at this time in good general health, the uric acid urea ratio equalled 1:113. No indican or acetone was present. On February 22d, the second day of an attack, the uric acid urea ratio was 1:176. Acetone and indican were present.

In the way of treatment, morphine hypodermatically or the giving of the bromides and chloral seemed at times to do some good.

Very little that is definite appears in medical literature concerning this curious disease, although in my reading I have doubtless overlooked much. The Paris thesis by Solelis was not accessible to me. Most writers refer to the article by Leyden¹ as the first upon the subject. This author discusses certain gastric crises under the title of "periodical vomiting," which condition he regards as a pure neurosis, the symptoms of which are practically identical in every way with those of the gastric crises of tabes. In the cases he described there were present great abdominal pain, frequent and very profuse vomiting, constipation, scanty urine, retracted abdomen, great exhaustion, and no fever. The abdominal pain was a very prominent symptom, and was sometimes associated with other neuralgias. There was no regularity in the intervals between the attacks. All the cases detailed occurred in adults. Myerhoff² describes in detail a similar case in a woman, in which abdominal tenderness and severe pain always attended the vomiting. Meisl³ reports cases very similar to those of Leyden. He states, however, that there was no pain except during the act of vomiting, and he insists on the regularity of the recurrence of the seizures. This regularity, at variance with Leyden's experience, is also insisted on by Einhorn⁴ in an article on the subject. Rémond⁵ collected from medical literature and from his own experience cases of periodical vomiting. In all of these intense pain was the most prominent feature. All were in adults.

There are a few other writers referring to the condition described by Leyden, but nearly all of them dwell upon the element of marked abdominal pain as almost or quite pathognomonic, and compare the attacks to the gastric crises of tabes. The condition appears to be an undoubted neurosis, which, although allied to, is yet different in some important respects from that which my own cases illustrate, about the purely neurotic nature of which there is some doubt. The difference in the amount of pain is one great characteristic. This view is held,

¹ Zeitschrift für klinische Medizin, 1882, iv., 605.

² Deutsche medicinische Wochenschrift, 1881, vii., 710.

³ Centralblatt f. d. gesammte Therapie, 1897, xv., 459.

⁴ Twentieth Century Practice of Medicine, vii., 343.

⁵ Arch. gén. de Méd., 1889, clxiv., 38.

too, by Boas,¹ who, in describing a series of cases of gastric neuroses, draws a sharp distinction between gastric crises and periodical vomiting, basing this on the marked element of pain and the presence of an excess of HCl in the secretion in the former, and the slight development or absence of pain and the absence of an excess of HCl in the latter. He agrees, however, with those who insist upon regularity in the periodicity of the attacks of vomiting. The cases of all the writers mentioned occurred in adults.

We have next to consider another condition described in medical literature, which also appears to differ from that now under consideration. Langford Symes² writes of what he denominates "gastric attacks." These occur in children only. There develop suddenly profound nervous disturbances, and the child seems alarmingly ill. There are constipation, vomiting, and even collapse. But the affection always depends on definite demonstrable dietetic causes, and the vomiting often relieves the attack. W. Soltau Fenwick³ describes under the title of "Recurrent Gastric Catarrh" a condition which, he states, is identical with "periodic" or "cyclic" vomiting. He claims that it is extremely common, generally mild, and depends upon a catarrhal state of the stomach. All this is at variance with the experience of other clinicians; and we are forced to the conclusion that the great majority of the cases on which his views are based do not belong to the category now under consideration.

A number of writers have described the disease as my own cases represent it. Gee⁴ details nine cases of what he denominates "fitful" or "recurrent" vomiting, of which probably five certainly belong to the disease now being discussed. Pepper⁵ contributes a valuable article upon the subject, although without details of cases. Snow⁶ gives the details of a case in a girl, aged eight years, which must certainly be classified with my own. In the discussion of this paper Seibert, Caillé, and Forchheimer reported having seen cases in children. Rotch⁷ gives a clear description, with the details of three cases of eight months, twenty-two months, and nine years respectively. Rachford⁸ describes three cases seen by him which are clearly instances of this disorder. The ages were eighteen months, two years, and four years. He makes some important suggestions regarding the pathology of the affection. Holt⁹ contributes a valuable chapter upon the disease, with the report

¹ Deutsche medicinische Wochenschrift, 1889, xv., 864.

² Dublin Journal of the Medical Sciences, 1897, civ., 112.

³ Disorders of Digestion in Infancy and Childhood, 1897, 233.

⁴ St. Bartholomew's Hospital Reports, 1882, xviii., 1.

⁵ Cyclopædia of the Diseases of Children (Keating), iii., 22; also supplemental volume, 631.

⁶ Transactions of the American Pediatric Society, 1893, v., 185.

⁷ Pediatrics, 841.

⁸ American Text-book of the Diseases of Children, second edition, 96; Archives of Pediatrics, 1898, xv., 605.

⁹ Diseases of Infancy and Childhood, 287.

of a case in a child of six years, and discusses the relationship of the affection to certain urinary changes. Whitney¹ describes a very typical case in a girl, aged eight and a half years. Marcy² gives a graphic description of the affection in three cases, two of which are included in my own report, since they were likewise more or less under my own care. The other case occurred in a girl of six years.

Fuller details of the cases of these writers will be given in the analysis which follows.

SYMPTOMATOLOGY. The four cases which I have observed have a striking likeness to each other, although differing in certain particulars. The first was a mild case, resembling in some respects the condition described by Symes, yet differing in the absence of any discoverable dietetic or other cause. The second case was one of unusual severity; the third and fourth cases were fatal. Comparing them with the last group of cases to which I have referred as found in literature, we observe a complex of symptoms which is eminently striking and characteristic, and which must be studied more in detail. These symptoms appear in separate attacks, which develop with more or less suddenness, and which are separated by more or less irregular intervals, during which time the child is, as a rule, in excellent health.

Prodromal symptoms of an attack may be absent, and the child begin to vomit without any evidence of previous illness. In other cases there are prodromes, but these are generally insignificant and indefinite, consisting of malaise, some coating of the tongue, loss of appetite, possibly headache, and some disturbance of the bowels, generally constipation, sometimes slight diarrhoea. These last but a few hours to a day, rarely longer. In one of my cases (IV.) prodromes lasted a week, and a furred tongue continuing a week was seen in one of Gee's cases. There is, however, never any distinct evidence or history of decided indigestion preceding or in any way connected with the outbreak of an attack.

Vomiting is the first and most striking symptom of the attack itself. From the outset it is obstinate and oft-repeated. At first the contents of the stomach are ejected, not, as a rule, showing any evidence of abnormal fermentation. Later the vomited matter consists of watery fluid, with mucus or bile, and sometimes with blood. Sometimes there is also violent unproductive retching. Generally everything put into the stomach is promptly vomited. Snow found that in his case the vomited matter contained an excess of HCl, but other writers have not corroborated this. Further investigation is needed on this point. The vomiting may sometimes cease temporarily and then recommence. Generally it continues very frequent until toward the close of the attack, and then gradually or suddenly ceases.

¹ Archives of Pediatrics, 1898, xv., 839.

² International Clinics, ninth series, iii.

Constipation is a very constant but not necessary symptom. It is sometimes so obstinate that no treatment has any effect whatever, the action of the bowel seeming to be paralyzed. In some cases, however, as, for instance, in that of Snow, it can be readily relieved, although the vomiting continues. In Whitney's case the bowels were slightly loose and offensive. In two of Gee's cases the bowels were not affected, except that in one they were sometimes whitish in color. In three of my own cases, although there were sometimes a few loose movements at the first, obstinate constipation soon became a very prominent feature. In no case reported does it appear, however, that relief of the constipation had any influence in bringing the vomiting to a close. Rather the bowels appeared to act because the attack was nearly over. This is also the opinion expressed by Leyden regarding the cases of periodical vomiting reported by him.

The *appearance of the abdomen* does not seem to be uniform. Retraction or flatness is probably common. It is referred to by several writers, and was present in at least two of my own cases. It does not appear to be any greater, however, than would occur in any asthenic state with empty intestines. This is in marked contrast to the periodical vomiting of Leyden. Distention of the abdomen by gas does not seem to occur.

Abdominal pain is a symptom almost entirely absent in the cases which appear to belong strictly to this category. As has been already pointed out, this is in sharp contradistinction to the very marked pain which characterizes both the gastric crises of tabes and the similar idiopathic gastric crises which the cases of Leyden and several other writers quoted represent. There is sometimes slight pain and tenderness during the attack, but no more than the fatigue of the muscles by the constant vomiting can well account for. This absence of severe pain seems to be the common experience of observers of recurrent vomiting in children. Only in one of Gee's cases could pain be called decided.

Thirst is commonly intense, due doubtless to the abstraction of liquid from the system and the inability to retain any ingested.

Appetite is generally completely lost. The *tongue* is variable. It is not, as a rule, as greatly coated as in cases of indigestion. Rotch refers to this fact as of diagnostic importance. The tongue was dry in Holt's case, and slightly coated in Snow's and Whitney's cases. In two of my own cases (III. and IV.) it was at first slightly coated, and later more so. Case I. also exhibited a coated tongue. I have no record of its condition in Case II. The *breath* is described as of a sickening odor by Rachford, while in two of my cases, Dr. Marcy, who was in attendance, noticed a very peculiar odor (acetone?). In the other two cases nothing characteristic was observed. Other writers do not refer to the matter. *Sore-throat* always attended in one of Gee's cases; tonsillitis

occurred in one of the attacks in Snow's cases and in some of the earlier attacks in one of my own (II.).

There appears to be no rule about the *temperature*. Rotch describes it as normal or subnormal in his cases. In the case reported by Holt it was elevated at the beginning, and later subfebrile or normal. In Whitney's case there was slight fever. In Snow's the temperature ranged from 100° to 105° F. In Seibert's case there was fever, as there was also in Rachford's cases and in some of Gee's. In my own experience there was decided fever in Cases I., III., and IV.; no record in Case II. It would appear, then, that in recurrent vomiting there is apt to be more or less fever during the attack, although this is not a necessary symptom.

Respiration is decidedly affected. In my second and third cases it was peculiarly sighing; in the fourth case irregular, and in the first case rapid. In Rachford's cases it was rapid, and often very greatly so as the exhaustion increased. The *pulse* generally becomes rapid. Often it is slightly irregular. The only exception I have noted to this opinion is the statement of Rotch, that the pulse is sometimes slow.

The condition of the *urine* is of great interest, but as yet no conclusions can be drawn regarding it. Rachford describes the urine as scanty during the attack, and in one case containing albumin and casts, which disappeared at once when the attack was over. The only case carefully studied with regard to the amounts of urea and uric acid present has been that of Holt. In this the ratio of uric acid to urea before the attack was 1:54; during the attack, 1:157 and 1:132; during convalescence, 1:50. In my own cases circumstances prevented the more extended and exact study of the urine which might have thrown light upon the pathology of the disease. In Case I. the secretion of urine was sometimes increased as a prodromal symptom, but scanty during the attack. The analysis during convalescence, made for me by Professor John Marshall, showed a ratio of uric acid to urea of 1:116. It must be stated, however, that some trace of the symptoms was still remaining. In Case II. the amount of urine was generally diminished, and sometimes greatly so, during the prodromal period and in the attack itself. During convalescence urine was passed freely. In Case III. urine was increased in amount just before the attack, and contained indican. Later it was diminished and acetone was present. In the last attack it contained albumin and casts. In Case IV. exactly the same condition was observed as in Case III. Beside this, an examination for uric acid and urea at a time when the child seemed in good health gave a ratio of 1:113. Another examination made on the second day of an attack gave a ratio of 1:176. The observations on the uric acid urea ratio in my own cases are, therefore, not conclusive.

The *nervous and general symptoms* are interesting. In Snow's case convulsions commonly occurred in the earlier attacks, but were absent in later ones. I find no other instance of this symptom recorded. Extreme restlessness with constant tossing and the occurrence of very little sleep were noticed in two of my cases (III. and IV.). The presence of restlessness was observed by Rotch in one of his cases. Later in the disease exhaustion becomes extreme, emaciation is marked, and the child lies apathetic, although generally entirely conscious. In bad cases a state of collapse is present, from which it may seem impossible that the patient can rally. Itching of the skin was present in two of my cases.

The *duration* of the attacks is variable. Recovery is generally rapid. In Holt's detailed case the attack lasted always five days, although improvement began on the third day. In Whitney's case it lasted about three days, and convalescence was rapid. Rotch regards two to three days as the average duration, and the recovery sudden; but in some of his cases the attacks lasted seven days, and in one instance two weeks, with slow convalescence. The attacks in Snow's patient varied from five to sixteen days in length, and in Rachford's patient from two to four days. In one of Gee's cases the duration was about ten hours, in another seven to ten days, in another eleven days.

In one of my own cases (II.) the worst attack lasted possibly a week. In another case (III.) the longest was ten days, but the final fatal attack only two days.

Even in the cases in which exhaustion has been extreme and vomiting incessant, convalescence is generally astonishingly rapid. The first sign of improvement is perhaps a diminution in the frequency of the vomiting, with return of some strength to the pulse and some warmth to the extremities, while the whole appearance changes for the better. Then vomiting soon ceases entirely, appetite returns, and the child is practically well except for a certain degree of weakness, which also rapidly disappears.

The *frequency* of occurrence of attacks varies greatly. In the disease described by Leyden the seizures came on at irregular intervals. Certain other writers, however, as has already been pointed out, have insisted on a decided regularity in the occurrence. In the recurrent vomiting which we have under consideration, on the other hand, no case reported has exhibited any tendency to distinct periodicity except Whitney's patient. In this case the intervals were generally three months. Holt's patient usually went five to six months without an attack, and Snow's from six to twenty-five weeks. In Rachford's cases the interval varied from four to eight weeks. So, also, in my own cases no regularity at all could be discovered. In Case I. the attacks occurred every few weeks during a few months, with no attack since. In Case

II. the intervals varied from two to fifteen months, with seven attacks in all; in Case III. from one to seventeen months, with eight attacks in all; in Case IV. from one to twenty-two months, with five attacks in all.

NATURE AND CAUSE. To the group of cases under consideration we can perhaps best apply the term "recurrent vomiting"—a name first employed by Gee. The title "cyclic," although popular, is misleading, because a cycle denotes a definite regularity in occurrence. "Periodical" likewise implies a certain degree of regularity. "Persistent vomiting," as it is called by Rotch, does not indicate that the attacks recur. There seems to be no term left us, then, but that of "recurrent vomiting."

This group of cases seems certainly different in nature from that which the cases described by Leyden, Rémond and others form, in which pain is such a prominent feature, and of which the purely neurotic nature seems assured. It differs, too, from the affection described by Fenwick, Symes and in part by Gee, in which dietetic errors are apparently the certain immediate cause. Yet even in recurrent vomiting, as I have limited the term, the cause and nature are very possibly not the same for all cases. It seems at least sure that the attacks depend in no way upon errors in diet. As the case-histories show, there is comparatively perfect health between the attacks, so far as the digestive apparatus is concerned. It is true that the prodromal symptoms are to some extent those of disturbed digestion, but they develop in spite of the greatest care in the diet, and seem to come from within the patient rather than from without. Moreover, when the attack has commenced the emptying of the stomach by vomiting gives no relief, as would be the case in ordinary acute gastric disturbances.

The points in common shared by recurrent vomiting, the painful periodic vomiting of adults, and the attacks of gastric pain, with or without vomiting, which occur in tabes, suggest the view that recurrent vomiting may be a gastric neurosis. That this is the true nature is the view of Rotch and of Whitney. Snow believes this to be true of his case, and regards the marked hyperchlorhydria of the vomited matter as confirmatory of this view. But, as previously stated, it is not proven nor even likely that hyperchlorhydria is the general condition. There is, indeed, decided ground for the belief that the recurrent vomiting of children is not a pure gastric neurosis, as the periodical vomiting of Leyden is claimed to be. Rachford makes the valuable suggestion that the attacks are due to lithæmia or some condition allied to it, and believes that there is the absorption and storing up in the system of some leuco-maines. He considers the disease a lithæmic gastric neurosis allied to migraine. This view is supported by the fact that in one of his patients the symptoms changed into those of migraine as the child grew older. The condition of the urine in Holt's case points in the same direction.

Yet further study is needed. The examinations of the urine in two of my own cases are not entirely confirmatory. The occurrence of albumin and tube-casts in one of Rachford's cases, and of a terminal nephritis in two of my own, together with the post-mortem findings in one of them, certainly suggest that the disease is due to the presence of some toxic substance circulating in the blood—probably not uric acid, but some toxalbumin possibly allied to it. The presence of pruritus in two of my cases and the occurrence in one of them of diffuse articular pains after an attack point toward a disordered hæmic state. There very probably occurs a gradual storing up in the blood of some toxic substance, possibly developing primarily in the intestine, possibly formed in the tissues, until finally the limit of tolerance is reached and an attack takes place. This is the view likewise to which Pepper clearly leans.

The presence of acetone in the urine in the worst attacks of two of my own cases probably indicates that great disturbances of metabolism are present, and is a further proof of the existence of a toxæmia. Acetone itself, however, cannot be considered the poison which produces recurrent vomiting, since the symptoms of acetonæmia are not such as these cases exhibit.

We may naturally conclude, then, that recurrent vomiting may perhaps be a neurosis, but, if so, is one of toxic origin, in some way connected with faulty metabolism.

Regarding the influence of *age*, the disease may begin at any time in childhood, but in the majority of cases the first attacks were seen within the first three years of life, although generally after the first year.

The existence of a *neurotic family history* has been observed in a number of instances, and may well be a predisposing cause. In Rachford's cases a gouty family history is reported. Sometimes the child itself is distinctly neurotic and high-strung, as in the case of Whitney and in one of my own (II.). Occasionally, too, it has been reported that the children have been of rather delicate health; but in the majority of instances the general health has been excellent.

There may possibly be various immediate determining causes for an attack other than those mentioned. Exhaustion, fatigue, exposure to cold, and overexcitement have all been referred to in a general way by writers. But the actual association of these with attacks is most uncertain if we study the details of published cases. The most careful supervision of the life of my own cases failed to show the influence of these or any other immediately exciting causes.

DIAGNOSIS. The diagnosis is not difficult when the attack is well established and is not the first from which the patient has suffered. As already pointed out, recurrent vomiting is to be distinguished from

the periodical vomiting described by Leyden. This latter affected adults, was always unattended by fever, and exhibited abdominal pain as a very prominent and often the most prominent symptom. The onset of some acute infectious disease can generally be distinguished by the development of other symptoms which are characteristic. Meningitis, particularly the tubercular form, may cause confusion at first. But the onset is much more gradual in the latter affection, vomiting is not commonly so frequent, and there is an increasing apathy and tendency to stupor, with rigidity, and finally with vasomotor and possibly ocular symptoms, all of which are quite distinctive. Nephritis is to be distinguished by a careful study of the urine at the onset. Acute indigestion is differentiated by the initial heavily coated tongue and other signs of a disturbed stomach, the character of the vomited matter at the beginning, the tendency for diarrhoea to develop soon in most cases, and the relief which vomiting usually gives after a few hours or a day have elapsed. Especially characteristic of recurrent vomiting is the tendency to repeated attacks which can in no way be associated with the ingestion of unsuitable food. Intussusception or other form of intestinal obstruction causes, perhaps, the greatest difficulty in diagnosis, especially as obstinate constipation is such a prominent symptom of recurrent vomiting in many cases. In one of my own patients (II.) obstruction was strongly suspected by the physician in attendance. Only a careful study of the case will enable a decision to be made, and then not always with certainty. Chief among the points of diagnosis in favor of recurrent vomiting are the tendency to repeated attacks and the absence of severe abdominal pain. As contrasted with intussusception there is also the absence of bloody mucous stools and of any discoverable tumor. Generally, too, although constipation can be temporarily relieved by treatment, the vomiting persists until the attack is about to terminate.

PROGNOSIS. This is generally good, although not necessarily so. Recovery nearly always takes place, even from a condition of most alarming prostration. That cases do die, however, two of those reported show.

With regard to the likelihood of the recurrence of attacks, experience with the disease has not been sufficient as yet to allow of any positive conclusions being formed. It seems probable, however, that the disposition of the attacks to recur diminishes as the child grows older. This we can reasonably hope for, since we know that in children vomiting is brought on by many causes much more easily than in later life. In one of my own cases (I.) the affection seems to have disappeared. In another (II.) a longer time has now elapsed than ever occurred before. In one of Rachford's cases the disease was replaced by migraine as the child grew older. In Holt's case and in one of Rotch's the disease seemed to cease with increasing age.

TREATMENT. This is most unsatisfactory. The attack once developed generally goes on in spite of treatment until it exhausts itself. Being entirely ignorant of the nature of the exciting or more remote causes, our preventive treatment can be only experimental. Every element which can be even suspected as an etiological factor must be sought for and removed. Alterations in the diet should be tried; overwork and overplay guarded against, and constipation most carefully prevented. If prodromal symptoms seem threatening, a free purgative may possibly do good by removing poisonous matter from the blood. Care must constantly be taken to maintain a free action of the kidneys.

Should an attack have actually commenced the first indication is to open the bowels freely by an injection, or, still better, by saline cathartics or calomel if the child can retain them. But after the first effort it is well to administer nothing whatever by the mouth, whether food or medicine, thus giving the stomach absolute rest. The use of opening enemata should be discontinued and the bowel reserved for small concentrated nutrient enemata and the administration of medicine. Perhaps the best drugs to use in this way are chloral and the bromides in full doses. Morphine hypodermatically has certainly done good in some instances. This was notably true in my second case, where the narcotizing of the child seemed to be the means of saving his life. It should certainly be tried early in all bad cases. Stimulants by the rectum and strychnine and digitalis by the skin are to be used as needed. Hypodermoclysis is a treatment for severe cases which seems to offer the hope of benefit. Ice or counter-irritants to the epigastrium may be tried. As the disease advances, and especially if a lull in the vomiting occurs, it is safe again to try to obtain a free action of the bowels by the administration by the mouth of repeated doses of phosphate of soda or Rochelle salts. This is on the principle that if the vomiting is an effort by nature to eliminate the poison from the system free drainage through the bowel may aid in accomplishing this end. But there is nothing to be gained at any time by a mere unloading of the bowel by enemata, as though the constipation were the cause of the vomiting.

ANEURISM OF THE ARCH OF THE AORTA, WITH RUPTURE INTO THE SUPERIOR VENA CAVA.¹

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AMONG the terminations of aneurism of the arch of the aorta one of the rarest is that which occurred in the case that forms the basis of this

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report. Most of the recorded cases are analyzed in the paper presented before the Association in 1890 by Drs. Pepper and Griffith. An interesting case in which the condition was recognized during life was subsequently published by Dr. Alex. Bruce¹ in 1895. I venture to record the present case because its characteristic features permitted a recognition during the life of the patient, and because it further illustrated some points in the prognosis which the analysis of previous cases have made clear.

I am indebted for the notes of the case and the privilege of reporting it to Dr. W. O. Xander, with whom I saw the patient.

C. H., a German-American, aged thirty years, a teamster. Weight, 150 pounds. (Fig. 1.)

He used no alcohol and smoked moderately. The family history was good; both parents living and well. He had two sisters and three brothers, of whom one is suffering from post-typhoid insanity.

FIG. 1.

The patient had scarlet fever at four and an attack of inflammatory rheumatism at twelve; at twenty-five, a second attack, which lasted four months. He had gonorrhoea three years ago, and was treated irregularly by a druggist. The running kept up for eight weeks; since then he has had difficulty in passing urine. A month before the fatal illness he had another attack of rheumatism, which kept him in the house for three weeks. His doctor told him to go to work to get the stiffness out of his bones. He accordingly went to work, hauling pipes, and felt very tired all week, and had shortness of breath on going up stairs. There was no swelling of his feet. His appetite was good.

From a photograph of the patient taken a short time before his illness.

Present History. At 3 o'clock, January 27, 1900, while at work, he suddenly felt a dull pain in the chest and a choking sensation in his throat. Immediately he began

to swell, and was taken to his home, and Dr. Xander sent for at 5 o'clock. The pulse-rate was 90, temperature 96°, respirations 24. He complained of fulness and pain in the throat. His neck and face very much swollen and cyanosed. Examination of the throat was negative.

At 10 P.M. the swelling and distention of the veins extended down over the clavicles; there was no pain, but very great restlessness; he complained of dryness and choking in the throat.

Sunday, January 28th. No sleep. Temperature 95.4° (mouth), 99.5° (rectal); pulse 90, respirations 24 and labored, though the resonance was good over both lungs. The nose and ears were very much cyanosed. The veins on his forehead greatly distended, and there was free perspira-

¹ Edinburgh Medical Journal, vol. 21., Part II., p. 898.

tion about his head. The lower half of the body was normal. Air hunger was marked. (Fig. 2.)

29th. Edema and cyanosis have now involved the chest, both anteriorly and posteriorly to the waist line. Size of neck, eighteen and one-half inches. In health wore a sixteen collar. Choking became more marked. Thought he might strangle, so called in Dr. Roberts to intubate him. He suggested venesection.

30th. No sleep. Is not able to lie down. Neck measures nineteen and one-half inches. Opened cephalic vein and allowed twenty-one ounces of blood to flow out, which gave him considerable relief. Though no decrease in the size of the chest or neck, it was noticed that cyanosis was somewhat less marked.

FIG. 2.

Appearance of patient after onset of the disease. The dark discolorations on the chest and shoulder are ecchymoses.

31st. Dozed for a few minutes at a time sitting in a chair. Voided six ounces of urine. Bowels opened with calomel. Basham's mixture ordered.

February 1st. Temperature 97.4°, pulse 96; urine, ten ounces in twenty-four hours. Scrotum beginning to swell. Venesection (brachial), fifteen ounces. Edema appears in both arms, right more than the left. Veins on back very prominent. Blue veins along the waist line fading away.

2d. Only sleeps a few minutes at a time in a chair. Complains of weight of scrotum. Went down stairs twice to wash.

3d. Swelling in arms increased; no edema in feet. Size of scrotum is uncomfortable.

4th. Made deep puncture into scrotum and bandaged it tightly to hasten the flow of serum. Venesection, nine ounces.

5th. Says he feels better. Scrotum much reduced in size. Still dozing. Temperature 98°, pulse 100. Feet beginning to swell.

6th. Slept a few hours under chloral and potassium bromide, 10 grains each. Cannot lie down.

7th. Very restless during night, even irritable at times. No pain; right foot swells more than the left. Has headache. Urine, fourteen ounces.

9th. Temperature 99°, pulse weak, respirations 24. Appears to dream a good deal, but can readily be aroused and appears rational.

10th. Scrotum filling.

11th. Is very irritable, complains of sick stomach. Bowels open, no pain, wants to go down stairs.

12th. Scrotum increasing in size.

13th. Very uncomfortable; walks constantly. Sleeps only when drugged.

14th. Slept poorly during the night. Complains of pain in scrotum, which measures eighteen inches in circumference. Vertigo. Urine, ten ounces. Bowels open. Temperature 100°, respirations irregular, average 26; pulse 120, and weak. Ordered potassium acetate.

15th. Œdema of scrotum extends into both inguinal regions. Painful. Scarification gave immediate relief, by relieving pressure in the lymph channels. Bowels open freely. Urine, seventeen ounces.

16th. Feels better. Scrotum much reduced in size. No pain, only dragging. Urine, eighteen ounces. Swelling increasing in both lower limbs.

18th. Basham's mixture. Passed eighteen ounces of urine. Bowels open freely. Says he feels comfortable, only a choking and fulness in the throat. Is tired of room, and wishes to go down stairs. Has been smoking, and is hungry. Complains of headache.

20th. Is getting restless; headache; pulse weak and easily compressible. Sits in a semi-conscious state a great deal, and talks wildly. Cheers up when aroused.

21st. Pulse 130, weak; temperature 101°, respirations 28 and labored, though he is able to take a long, deep inspiration. Was very restless during the night. Delirious when dozing. In one of these spells he tried to jump out of a window. Early in the morning came down stairs. Bowels moved three times; urine, twenty ounces. Scrotum very large again, and in right leg swelling extends a hand-breadth above the knee; in the left almost up to the knee. Died in convulsion at 11.45 A.M. Conscious twenty minutes before his death.

I first saw the patient with Dr. Xander on January 31st. At that time I noted the extreme swelling of the neck, especially above the clavicles, and the œdema of the face, arms, and chest as far as the lower thoracic or upper abdominal region. There was a sharp line of demarcation formed by the limit of swelling and by a zone of deep cyanosis and ecchymoses, which passed around the body a little below the ensiform cartilage. The superficial veins of the neck and upper thorax were greatly enlarged, but the deeper veins of the neck could not be seen or felt on account of the great œdema. There were several ecchymoses on the right shoulder. The lower half of the body and the legs presented a wholly normal appearance. The

patient could not lie down, and suffered with great dyspnoea in any position.

Physical examination was somewhat difficult on account of the degree of œdema. The cardiac beat was vigorous, heaving and situated outside the mid-clavicular line in the sixth interspace. A second centre of pulsation was detected in the region of the right third interspace, but this was diffuse and feeble. It was best developed by having the patient lean forward so as to throw the thoracic contents against the anterior wall of the chest. There was no thrill. The radial pulses were nearly equal, the right seeming a little stronger than the left.

On percussion an area of dulness was found to the right of the sternum, extending from the second to the fourth ribs and from a line one and one-half inch beyond the right border of the sternum to the left side of the sternum. Below and to the left the dulness was continuous with that of the heart. The cardiac outlines were bounded, above by the third rib, below by the seventh, and the extreme left limit was three-quarters of an inch beyond the left mid-clavicular line. Pulmonary resonance was normal on both sides. The liver extended from the sixth rib to within an inch of the umbilical line. The spleen could not be felt.

Over the area of dulness to the right of the sternum there was a murmur which was immediately recognized as having the peculiar characters of a venous bruit. It was continuous, but much increased during ventricular systole. The diastolic portion was long and vibrating in character, the systolic short and rather harsh. Excepting for the peculiar humming character of the diastolic sound, the murmur did not differ greatly from the double murmur sometimes heard in aneurisms of the first part of the aorta or in aortic-valve disease. The murmur was transmitted to the right as far as the anterior axillary line, but scarcely at all to the left. It could not be heard much beyond the left border of the sternum. The systolic sound was distinct over the body of the heart, but the diastolic was scarcely at all transmitted in a downward direction. Abnormal phenomena were sought for in the arteries and veins of the neck and arms, but were wanting. The second sound of the heart was inaudible in the aortic region, and was only faintly heard over the pulmonary artery. The breath sounds were equal in the two sides, and fremitus was likewise equal. There were sonorous and sibilant râles and some subcrepitant crackles at both bases. Nothing abnormal was found in the abdomen.

Autopsy. Body of a man, about 5 feet 7 inches or 8 inches in height. Enormous swelling above the waist line and very slight below the waist, the feet and legs to the knees and the scrotum being involved. The latter was discolored, the skin being a grayish-blue color, evidently in a state of beginning necrosis. There were several incisions in it, at the bottom of which grayish-yellow putrid tissue was visible. The swelling of the upper part of the body was found to be due to tense œdema, and the skin was of a mottled character, bluish in certain areas, and in some places showing distinctly enlarged veins. There were a number of incisions near the right shoulder, and about both arms where punctures had been made during life. On incision through the middle line the skin and subcutaneous tissues were found to be hard, and could be cut only with difficulty. Dark venous blood flowed freely from the incised tissues above the waist line. On close inspection it was found

that the veins of the subcutaneous tissue were greatly enlarged, though flattened out by the pressure. They presented the appearances of the uterine sinuses, and the blood flowed in steady streams. Below the waist line the incision was entirely dry, as the incision is customarily at autopsies. On removal of the sternum and ribs both pleural cavities were found to contain large quantities of serum, but this was particularly the case on the right side, where the effusion extended quite to the clavicle, and the diaphragm was depressed. The liver was pushed

FIG. 3.

a

b

Anterior view. The aneurism is concealed behind the pulmonary artery, the right auricle and the superior vena cava (b), which is opened to show the point of rupture (a). The probe passes into the innominate vein.

down and extended to within 2 or 3 cm. of the umbilical line. The lungs were considerably compressed and cedematous. On section frothy liquid flowed from the bronchi, and the substance of the lungs throughout was cedematous. After removal of the lungs, the azygos veins and intercostal veins were observed and found greatly enlarged. The large veins at the root of the neck could not be well identified, but were evidently enlarged, though bleeding from the subcutaneous veins had probably reduced their size, as the amount of blood lost in this way

was very considerable. The pericardium was incised, and was found to be thickened, and the tissues in the region of the remnant of the thymus were especially œdematous and indurated. The appearance was that of a secondary sclerosis following long continued œdema. The heart was found greatly enlarged, and its substance evidently quite flabby. The color as seen through the epicardium was decidedly pale and somewhat yellowish, and the course of the coronary vessels was marked by yellowish deposits of fat. On incision the substance of the left and the right ventricles was found to be very soft, and the color grayish-yellow. The right ventricle was particularly affected, and the

FIG. 4.

a

Lateral view, looking into the opened vena cava. The point of rupture is indicated at a.

walls so much thinned and weakened that the papillary muscles could be distinguished from the outside as nodular areas of hardening. On incision into the chambers, fluid blood was removed, and the cavities on both sides were greatly enlarged. The tricuspid orifice was quite evidently dilated; the hand could almost be passed through this orifice without stretching it. The pulmonary orifice and artery were first laid open and the artery was apparently somewhat dilated, but otherwise normal. The aortic orifice was then opened and the valves were found to be stretched so that they were evidently incompetent. The sinuses of Valsalva were pouched, and the borders of the sinuses as well as the mouths of the coronary arteries were densely sclerotic.

An aneurismal sac was discovered on the ascending portion of the aorta, extending toward the right. It was saccular in form, and about two and one-half inches in diameter. The endothelial lining was roughened and had atheromatous patches, especially in the upper and right side of the sac. There were a few soft clots within the aneurism, but nothing suggesting the formation of firm coagula. The sac compressed the superior vena cava from its entrance into the right auricle to the point of junction of the right and left innominate veins. The latter (left innominate) was somewhat compressed at its termination. The veins above the point of compression were greatly distended. (Fig. 3.) The aneurism was firmly attached to the vena cava, and a perforation was found in the latter just below the junction of the innominate veins. This communication was about a half inch in length and a quarter inch in width. The perforation occurred in the part of the aneurismal wall in which the atheromatous plates referred to were found. There had evidently been great thinning of the sac wall in this situation for sometime prior to the time of rupture. (Fig. 4.)

The lungs were intensely oedematous, and on section a large amount of frothy serum exuded. In places there were small hemorrhagic extravasations.

The liver was congested, though not extensively. The structure was in other respects quite normal. The kidneys, spleen, and other abdominal organs presented no noteworthy features.

It was quite evident at the first examination of the patient that he was suffering with aneurism of the first part of the aorta, and it was also clear that the superior vena cava had become obstructed. The only difficulty in the case was the determination of the cause of the obstruction. It was possible that this might be due to a sudden dilatation (without rupture) of the aneurismal sac, or to a clot in the vein, or to the condition actually present—rupture of the aneurism. The fact that aneurismal sacs may suddenly expand under the influence of strains is of course well known, and it is easily possible that such a dilatation might bring about a sudden compression of the vena cava, with symptoms like these described. A continued venous bruit might further be caused by such a narrowing. In the second place, a slow thrombosis of the vena cava above a constriction caused by pressure of an aneurism could also terminate in complete venous occlusion by separation of the clot and its lodgement lower down in the narrowed part of the vein. In this case, however, the symptoms would be more likely to develop more slowly than was the case in our patient, though the immediate effect of such a thrombosis with secondary dislodgement would be a sudden obstruction of the cava. The possibility of aneurismal rupture causing symptoms such as were present is well illustrated in the thirty cases collected by Pepper and Griffith. Their analysis showed the principal diagnostic indications to be the following :

1. Cyanosis, oedema, coldness, and distention of the veins of the upper part of the body with other evidences of obstruction to the circulation of the blood in the tributaries of the superior vena cava.

2. The suddenness of the onset of the symptoms.
3. Evidences from physical examination of the presence of a tumor in the thorax, and the probability that this is aneurismal.
4. The existence of a murmur characteristic of a communication between an artery and a vein.

These symptoms are sufficiently distinctive to establish the diagnosis, particularly if the last is well marked. The only difficulty in my own case was the fact that the humming diastolic portion of the murmur was not distinctive after the first examination, and during the remaining weeks of life did not differ greatly from the diastolic element of a murmur caused by an aneurism of the aortic arch with dilatation of the valve orifice or by simple aortic valve disease. One point of great significance was the right lateral transmission of the murmur and the absence of the murmur over the body of the heart, at the ensiform, and at the apex. Regurgitant aortic murmurs are so commonly propelled in these directions that it seemed clear that the bruit present in the case was of a different sort. On this ground the possibility of simple constriction of the vena cava by a sudden distention of the sac was excluded, and the humming murmur referred to a rupture rather than to a venous stenosis or aortic regurgitation. The autopsy showed the likelihood of the existence of some aortic regurgitation, but this had certainly not produced characteristic signs.

A matter of prognosis of interest is the probable duration of life and the possibility of cure. In the case of Damaschino and Lavin, in which recovery occurred, there is sufficient evidence to warrant the diagnosis, and a study of the specimen in my own case is convincing that recovery might occur. After the venous system has been engorged the backward and forward flow through the orifice of the rupture is apt to be much less than the location and nature of the lesion would make us imagine. Under these circumstances a clot might form that would obstruct the ruptured aorta. These considerations would lead to a thought regarding treatment, viz., that too active venesection may do injury by depleting the venous channels and thus restoring the strength of the systolic current through the rupture. Venesection should be performed when the danger to life is excessive, but ought to be moderate in the amount of blood taken.

As to the duration of life, the analysis of published cases establishes the surprising fact that some cases have lived for weeks and even as much as seven months after the rupture. In the case here reported the duration was twenty-four days, a long continuance considering the early severity of the symptoms and a further evidence of the possibility of occasional recovery.

SUBPECTORAL ABSCESS.¹

BY JOHN HERR MUSSEY, M.D.,
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I HAVE seen in quite recent years three cases of subpectoral abscess under the following circumstances. Although belonging within surgical lines, they presented such clinical features that it was thought well to have a general practitioner see them, hence my experience. A few of the symptoms are worth emphasizing, as well as the phenomena which made it my privilege to observe them.

CASE I.—A previously healthy man, aged about thirty-five years, was admitted to the wards of the Presbyterian Hospital, suffering from an abscess of the chest walls under the pectoral muscle. With the local symptoms, which were not unusual but characteristic, there were some rigors and intermitting fever. There was also some mild arthritis. The patient was desperately ill, and my colleague asked me to see him to determine whether ulcerative endocarditis prevailed or pyæmia had begun; in other words, whether the infection was limited, or whether other structures and the blood were involved. The surgeon was deterred by the heart murmur and the pyæmic symptoms to give an anæsthetic or shock the patient by an operative procedure, which would, he feared, be useless. I felt the heart murmur was due to anæmia and flabby dilatation, intensified by the febrile process. The operation afforded prompt relief.

The feature of prominence was the excess of general symptoms (fever, etc.) in proportion to the local phenomena. No cause for the abscess was determined.

CASE II. was also a patient in the Presbyterian Hospital, presenting the local signs of subpectoral abscess. He was a rather delicate man, twenty-two years of age, with high fever, sweats, rapid heart, and some embarrassed breathing. Inability to explore the chest thoroughly by physical examination led to the fear that the abscess was secondary to an empyema. I was asked to consider this question. Empyema was excluded, based upon the negative evidence on examination of the lungs posteriorly and laterally. Surgical treatment brought about immediate relief.

Trauma was the primary etiological factor. Its resemblance to empyema was the feature in this diagnosis.

CASE III.—A farmer of five and twenty years, robust, while training a colt, requiring physical and psychical strain, was drenched by a passing storm. This was followed by an attack of bronchitis and by apparent rheumatism of the right pectoral and shoulder region. His family physician prescribed salicylates. There was no relief and no

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May, 1900.

signs of local infection. At the end of fifty-six hours he had a chill, followed by high fever. The bronchitis continued; the chest pains, limited to the right upper anterior half, were severe, and sweats were alarming. The symptoms continued one week. After the first examination the chest surface was not exposed for further study. Examination with the ear and by percussion was negative, for soon the mass under the pectoral muscle prevented the transmission of sound. With the continuance of fever and sweats the patient lost flesh and strength rapidly. The blending of the symptoms of bronchitis and those of the infection led the attending physician and his colleague to make a diagnosis of acute tuberculosis. I was asked to see the case, to decide upon climatic treatment. Fortunately I could demonstrate the presence of a considerable mass under the pectoral muscle, and could exclude any signs of localizing tuberculosis. I could not with the data at hand exclude acute general tuberculosis, although I was certain the grave general symptoms were due to the subpectoral infection. Twenty-four hours later Dr. John B. Deaver opened the abscess, the extent and apparent virulence of which surprised him. The patient promptly recovered. Cultures yielded the streptococcus. Trauma caused the subpectoral bruise, leading to infection.

Here, again, the severe septic symptoms, unfortunately, coincident with the attack of bronchitis, led to an error in diagnosis.

There are two brief varieties—acute or phlegmonous, and chronic or cold, abscesses. The literature contains many cases, especially of the latter.

ACUTE OR PHLEGMONOUS SUPPURATION.

ETIOLOGY. 1. Traumatism is probably the commonest cause (Cases 1, 16, and 17), such as blows over the pectoral muscle. Excessive use of the muscle has been given as an occasional cause (Martin).

2. Next to traumatism extension of inflammation from some other point in the body, either by metastasis (Case 5) or by extension through the lymphatic channels (Cases 2, 6, 7, 9, 10, 21, and 22), as in those cases of suppuration following infected wounds on the arm or inflammation of the breast.

Pleurisy, either suppurative or non-suppurative, recent or old, is frequently the cause (Cases 4 and 15).

3. Rarely the malady seems to be idiopathic (Cases 11, 12, 13, and 20).

4. Taking cold has been described as a cause (Martin).

PATHOLOGY. The condition often proves fatal, so there have been a number of autopsies reported, and the pathology of the condition has been quite thoroughly studied. Certain anatomical considerations may be reviewed that will throw light on the phenomena observed. On the deep surface of the pectoral muscle is a cellular area lying on the ribs and intercostal muscles separated from them in the upper and outer portion by the lesser pectoral muscle and the costocoracoid membrane. To the outer side lies the axillary space separated from the subpectoral

space by the axillary fascia. There has been described a bursa interposed between the deep surface of the greater pectoral muscle and the ribs. Beneath the parietal pleura is a cellular tissue rich in lymphatics. These lymphatics communicating with the lymphatics in the cellular tissue beneath the pectoral muscle are of great importance as explaining the transmission of infectious agents from the pleura to the pectoral muscles.

The abscess usually occupies the cellular tissue between the deep surface of the pectoralis major and the plane of the ribs and intercostal muscles. The pectoral fascia, investing, as it does, the pectoralis major, offers an almost impassable barrier to the extension of suppuration beyond the muscles. Cases have, however, been reported in which the pus travelled along the pectoralis minor and entered the axilla along with the great vessels and nerves (Cases 15 and 21). There is often found, together with the pectoral abscess, an intrathoracic abscess, either subpleural or intrapleural, the external and internal cavities communicating through small openings. A case of pectoral abscess opening into the anterior mediastinum has been reported (Case 16); or, as in some cases, presenting no communication whatever. The latter are to be explained by the distribution of the lymphatics already mentioned. The suppuration, as it has been said, is limited to the pectoral muscle, yet within these limits it may be either diffuse (Case 13) or circumscribed.

SYMPTOMS. An interval of several days frequently elapses between the infection or traumatism and the onset of symptoms, but the symptoms may rapidly follow the cause. The commonest early symptom is a vague tenderness somewhere in the muscle. This may precede the development of the tumor by as much as a week. Soon after this movements of the arm become painful. Hence, in some instances the diagnosis of rheumatism. Then follow in most cases the general symptoms: Fever, chill, loss of appetite, coated tongue. Then the local signs appear. There may be either a well circumscribed tumor, or the whole pectoral region may project forward; the latter is usual. Pain and tenderness are usually well marked. The skin, at first normal in color and temperature, becomes red, hot, and later œdematous, especially along the lower border of the pectoralis major, although in the third of my list of cases no local signs were noted for one week. The infraclavicular fossa is effaced by the swelling and the axilla encroached upon. Palpation reveals fluctuation. At first, when the tumor is deep seated, fluctuation may not be detected; but when considerable pus has formed, and there is a tendency to point toward the inferior border of the pectoralis major, it can always be elicited. The following method given by Prieur will usually be found satisfactory: If it is the right side that is under examination, place the fingers of the left hand under

the anterior fold of the axilla, the pulp of the fingers being forward, the right hand over the pectoral muscle. With the fingers in these positions alternate pressure is made, as is usual in looking for fluctuation. The axillary vein and lymphatics of the arm are pressed upon by the swelling, giving rise to œdema of the upper extremity.

Such external abscess follows interlobular empyema. In two instances in children the pus had found its way to the surface in the third interspace, presenting a globular tumor.

If the abscess communicates with another inside the thorax, other symptoms are added which make the diagnosis somewhat difficult. There is apt to be, in addition to the foregoing symptoms, cough and dyspnoea, together with the physical signs of a mass within the thorax. The external abscess may be affected by respiratory movements. It becomes tense on inspiration, flaccid on expiration. There is an impulse on coughing.

The infection is at times of a pyæmic nature. The symptoms rapidly become typhoid, and death follows. These symptoms were noteworthy in my cases, and led the local symptoms to be considered of minor importance in the case.

DIAGNOSIS. The authors have little to say concerning this. When the abscess is entirely extrathoracic, careful physical examination would exclude any intrathoracic trouble. When there is a communication with an abscess within the thorax the diagnosis becomes more difficult. It will be considered below, under the heading of Cold Abscesses. In the early stage of the acute abscess, when the only local sign is tenderness and the general symptoms have not developed, the condition might be mistaken for rheumatism or intercostal neuralgia. Case III. of my list was thought to be rheumatic at first. But the diagnosis could not long remain doubtful on account of the course of the process.

COLD ABSCESSES.

Chronic or cold abscess in the region of the pectoral muscle. Cold abscesses of the thoracic wall have attracted considerable attention from the profession during the last half century. It has been the subject of numerous monographs.

ETIOLOGY. Since the pathology of tuberculosis has been understood the nature of these cold abscesses has been made clearer. They are usually, perhaps always, tuberculous. They originate either primarily in the muscle (Morestin) or secondary to some other tuberculous focus, such as osteitis of ribs, pleurisy, or tuberculous cavity in the lung. The tubercular diathesis is commonly present. Traumatism is frequently a determining cause.

SEATS. 1. Antero-superior part of the chest, particularly near the costosternal articulations.

2. Posteriorly near the angles of the ribs.

3. The lateral portions of the chest.

We will consider only those abscesses occurring in the neighborhood of the pectoral muscle. These, indeed, are the most frequent.

PATHOLOGY. It may be primary in muscle, being the first focus of infection within the individual, or more commonly it is secondary to tubercular foci, as already stated. The abscess frequently occupies the cellular tissue on the deep face of the pectoralis major, and may involve the muscle itself. It is in these chronic abscesses that communications with intrathoracic collections of pus are most common. The primary abscess is usually intrathoracic, having its origin either in a tuberculous osteitis or periosteitis of the internal face of the ribs or in a subpleural collection.

Small abscesses in the subpleural tissue have attracted considerable attention, and are thoroughly studied in the monograph of Marmarian. They probably originate by transference of infectious material from the pleural cavity through the lymphatics to the subpleural tissue without suppurative inflammation of the channels through which they pass. These subpleural collections, having their origin either in the pleura or in the ribs, increase in size, burrow through the intercostal muscles, and infect the subpleural collections without actual extension of inflammation by continuity.

SYMPTOMS. Localized tenderness develops long before the abscess in most cases, although occasionally the trouble may not be noticed until the abscess is of a considerable size. There are no general symptoms except those of the tuberculous diathesis. Local symptoms are characteristic, and usually quite different from those of acute abscesses. At first the tumor appears, varying in size from that of a pigeon-egg to a small orange. It is firm, rounded, not adherent at first; the skin is free over it, not reddened or hot; fluctuation is indistinct at first. When the abscess communicates with an intrathoracic collection or arises from a carious rib, it is adherent to the deep structures; later fluctuation becomes distinct, especially at the centre, while the periphery of the mass remains firm and the skin is apt to become adherent. Eventually the abscess points. Its course is slow, lasting over a year or two.

DIAGNOSIS. Before the tumor appears the localized tenderness may suggest intercostal neuralgia. The latter may be differentiated by reference to the points of Valleix, which, of course, are tender in neuralgia, while the tenderness of cold abscess may be at any point. After the tumor has appeared, on account of its indolent character it may be mistaken for a hydatid cyst, syphilitic gumma, lipoma, or a sarcoma. It can be diagnosed from these tumor formations by reference to the points commonly given in surgical text-books. Yet, it must be con-

fessed, the diagnosis is often difficult. It may be necessary to resort to exploratory punctures.

When the abscess communicates with an intrathoracic collection (indicated by reducibility and changes in tension during respiratory movements), it becomes necessary to determine whether the pleural cavity or the lungs are involved. The difficulty lies in the fact that the subpleural abscess closely resembles the ordinary pleural abscess or empyema, especially when the latter is encysted. A free collection of pus within the pleura may be distinguished by its movability. In either case the history of an acute pleurisy might throw light on the diagnosis. Radat gives the differential diagnosis between subpectoral abscess originating within the thorax and those having their origin without. In the case of the former there is a history of some illness, such as pleurisy or "suppurative pneumonia." The fluctuation appears as soon as the tumor appears. If there has been pleurisy the respiratory murmur is absent, and there is dulness on percussion. If the abscess has its origin within the lung there is dulness and bronchial breathing and other signs of "chronic pneumonia, such as moist râles, cavernous breathing, etc." The writer must emphasize the great value of the history indicating the sequence of pathological events, with the physical signs and the immediate occurrence of fluctuation.

The following cases are gathered from the literature to illustrate the statements made above:¹

CASE 1 (Briband).—Etiology. Blow on the right breast. Symptoms, painful swelling limited to the pectoralis major appeared soon after injury. There was immobility of the arm; skin was not involved; fluctuation just below the clavicle; œdema of the surface. Operation. Death in three weeks from sepsis. Autopsy. Abscess of the posterior surface of the muscle, limited by its aponeurosis; adherent pleura opposite the abscess; peritonitis.

CASE 2 (Briband).—Etiology. A man, aged forty-three years. Angioleucitis from furuncle on the arm, followed by enlargement of the axillary glands. Symptoms, abscess limited to the pectoral muscle, causing painful swelling of the whole region. Skin hot, red, and œdematous; arm useless. Fluctuation at inferior border of muscle. Operation. Recovery. Operation revealed large cavity under the pectoral muscle containing bloody pus.

CASE 3 (Briband).—Etiology. A woman, aged thirty-five years. Followed a cured mammary abscess. Interval not stated. Symptoms: First, tenderness at the insertion of the pectoralis major, then swelling of the whole pectoral region. Redness of the skin; obscure fluctuation below; marked general symptoms. Operation. Recovery. Was diagnosed *rheumatism* at first.

CASE 4 (Briband).—Etiology. From an old pleurisy. Symptoms: Began with chill and other general symptoms, followed by swelling of

¹ I am indebted to Dr. Fred. Howard for the review of the literature and other valuable assistance.

the pectoral muscle. Terminated in death. Autopsy. Subpectoral abscess extending into the axilla. Two localized abscesses in the pleura in the pectoral region. An old pleurisy with two litres of fluid.

CASE 5 (Renant).—Etiology. An abscess at the elbow, of unknown origin. Two abscesses developed—one at the anterior fold of the axilla, and one opposite the middle of the sternum. Purulent cough followed; pressure over abscess produced gurgling; subcutaneous emphysema toward the clavicle. Terminated in death. Autopsy. Subpectoral abscess, involving muscle opening through the third interspace, through the pleura into the lung. No signs of tuberculosis in the lung. Pleura adherent only at the point of perforation.

CASE 6 (Prieur).—A young sailor, perfectly well, developed a swelling limited to the pectoral; freely movable; painful, indistinct fluctuation; skin red; no fever or other general symptoms. Diagnosed as *sypilitic myositis*. A deep incision through the pectoral gave vent to pus. Patient had an infected finger.

CASE 7 (Prieur).—A man, aged twenty-eight years. Blow on the finger caused inflammation, which recovered without treatment. Six days after development pain in the axilla, fever, and anorexia. Pectoral muscle tender and swollen. Motions of the arm painful. Incision at lower border of the muscle opened a pectoral abscess.

CASE 8 (Prieur).—Man, aged sixty-two years. Anterior axillary wall swollen, tender, and hard. Faint fluctuation; subpectoral abscess opened by incision along lower border of muscle.

CASE 9 (Lesigne, quoted by Prieur).—An abrasion on finger, followed by pain in the pectoral muscle; then general symptoms. Great pain on motions of arms. Pectoral muscle then became swollen. Subpectoral abscess opened by incision. Case was diagnosed as *acute articular rheumatism* before abscess developed.

CASE 10 (Lesigne, quoted by Prieur).—Abrasion of finger. Angio-leucitis extending up the arm, followed in six days by swelling of the axillary glands. Oedema and immobility of the arm. In twelve days pectoral abscess. Incision below pectoral muscle. Death.

CASE 11 (Watson).—A pulsating swelling below the clavicle, nothing in history to account for it. Pulsation ceased. Signs of pus increased. Abscess opened and ordinary pus was evacuated. Pulsation probably due to proximity to axillary or subclavian artery.

CASE 12 (Frost).—Patient was a pronounced alcoholic. Had been on a spree; was admitted to the hospital unconscious. The day before felt ill, and the right arm was stiff; examination showed pectoralis major prominent and oedematous along the lower border. Arm oedematous. No operation. Death in twenty-four hours. Autopsy showed diffuse suppuration under the pectoral muscle.

CASE 13 (Martin).—Case of subpectoral abscess from excessive use of the muscle.

CASE 14 (Velpeau).—Began with a chill and vague pains in the left side. The next day general symptoms developed. Pectoral muscle became tender, swollen, and indurated. Then oedema and fluctuation developed. Abscess opened along lower border of muscle. Symptoms were relieved. After two days the fever rose and pleural effusion appeared. The patient sank and died after nine days. Autopsy showed subpectoral abscess extending along the pectoralis minor into the axilla. The pleura contained two circumscribed abscesses about opposite the

subpectoral abscess. Both had thick walls, and were evidently old. There was no communication between them and the external abscess. The pleura contained two litres of fluid, the lung was normal.

CASE 15 (Allen, H.).—Patient admitted to the hospital seriously ill. Weak pulse and rapid respiration. Examination showed the usual signs of subpectoral abscess, with one peculiar symptom, namely, appearance of a wave at the summit of the collection during expiration. Operation; death. Autopsy showed subpectoral abscess communicating with the anterior mediastinum through an ununited fracture in the third rib.

CASE 16 (Scholz).—Young man, aged twenty-three years, perfectly well, kicked in the right breast two months before admission. The pain of the injury disappeared, but was followed by a swelling extending from the sternum to the border of the pectoral, from the second to the fifth rib. Skin red, slightly higher in temperature. When the pectoral muscle was put in action, swelling became harder and the inner portion bulged forward. There was no pain, only tenderness on pressure. No general symptoms. Operation followed by erysipelas, pyæmia, and death. Autopsy showed caries of the fourth rib, subpectoral abscess, emboli of the lung, peritonitis.

The author reports a case from Pitha's clinic of traumatic subpectoral abscess due to shot of revolver. The infection extended to the abdominal cavity.

CASE 17 (Cheever).—A young man, possibly syphilitic, otherwise perfectly well, developed swelling in the region of the pectoral, partially obliterating the axilla, considerable pain, abscess pointed.

CASE 18 (Cheever).—Young unmarried woman. Abscess under the left pectoral, the left breast prominent, superficial veins engorged, the left axilla partly filled, general symptoms very marked; operation; recovery. The author pointed out the great resemblance to mammary abscess and to subcutaneous emphysema.

CASE 19 (Werner).—Young girl, aged seventeen years, began with pain in the pectoral region and immobility of arm. Swelling followed at the border of sternum at level of third rib. Skin at first normal, later reddened, general condition good. Abscess opened, large subpectoral cavity found. Recovery.

CASE 20 (Werner).—Woman, aged thirty-three years. Sometime before had a wound of the finger that healed perfectly. Eight days before observation, developed pain in the axilla, and infraclavicular region filled up, swelling of the pectoral region, general condition good. Axillary glands were irritated and enlarged; abscess opened, found to extend in the axilla.

CASE 21 (Werner).—Boy, aged fourteen years. Developed traumatic scarlet fever (?) from an infected wound of one finger. Then, after subsidence of rash, swelling developed in the pectoral region, which was opened, giving exit to yellow pus. Extensive cavity extending nearly to the clavicle. Recovery.

CASE 22 (Werner).—A man, aged thirty years, seized with severe pain in left arm, which extended to the pectoral region, was followed by development of an abscess. The pain in arm probably due to swelling of axillary gland. Operation; recovery.

CASE 23 (Stiftung).—Illustrating communication of abscess with lung. Patient, aged forty-six years; day laborer. Had been suffering for eight days, without known cause, from an abscess under the left collar

bone. The clavicular portion of the large breast muscle was gone. The left lung was tuberculous. On the tenth day afterward, in the morning, the abscess broke and the hand showed, on pressure, a knotted mass. The patient was breathing with difficulty. In the night he had a severe coughing attack, mucous expectoration came freely, and the abscess broke into the lung. It contained air and fluid. Pressure with the finger would empty the abscess, and a full breath would fill it with air. The coughing continued very severely, excited by the pressure. The abscess grew smaller, and in fourteen days there was only a little hole and a little fluid. Communication with the thorax was almost closed up, and fourteen days after that there was no fluid discharged.

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BIOLOGICAL STUDIES WITH REFERENCE TO PATHOLOGY.

(A DELICATE TEST FOR TOXIC STATES OF THE BLOOD.)¹

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AUTO-INTOXICATION and toxic states of the blood have been subjects of much discussion, and the theories which are advanced are not without a sound clinical and pathological basis. At the present epoch in medicine gratifying results may be hoped for when there is reason to believe that disease is caused by toxic substances present in the body which assume the importance of being the essence, the *vera causa*, of disease. This idea is rapidly becoming a prominent factor in the etiology of disease.

Neurologists have expressed the opinion that the toxic theory is destined to clear away much of the present vagueness regarding the pathogenesis of nervous and mental disorders. The structural changes found in many diseases may after all be mere manifestations of a toxic state of the blood due to poisons produced in the body itself or introduced from without.

This doctrine is strongly supported by many clinical facts. The most distressing symptoms have been promptly relieved when this condition was recognized. Mental confusion and depression, epilepsy, hysteria, neurasthenia, and even more profound mental states, as melancholia and mania, have been cured by remedies directed to relieve obstinate constipation, improve digestion and assimilation. Many reasons, therefore, seem to show that toxæmia has a wide-spread effect on disease, and it is of great importance that these conditions are recognized early, for the continuous action of toxins produce irretrievable damage and annul the working power of vital organs.

In the past year the author has studied the changes occurring in the cells of some of the protozoæ and algæ when treated with various toxic substances. The spirogyra, a species of the algæ, was found to be the most suitable for the study of intracellular changes. Among the plants growing in still and slowly flowing waters the spirogyra is probably the most common. It forms a thick green coating on the surface, composed of delicate fibres; it is easily recognized, and under the microscope the threads appear as linear aggregations of the cells. The cells forming the threads are cylindrical, transparent, and are arranged

¹ Read at the thirty-fifth annual meeting of the Michigan State Medical Society, July 12, 1900.

end-to-end in single rows, surrounded by a cellulose wall, separated from the adjoining cell by a partition composed of the same substance. Lining the inner surface of the cell wall and separating from it the cell protoplasm is the protoplasmic cylinder, which consists of a very delicate double membrane (the inner and outer protoplast), surrounding the chlorophyll spiral bands or chromatophores and protoplasm. The spiral bands vary in number from one to eight or more; they have a regular arrangement, and are of a beautiful light-green color, in which are embedded numerous star-like bodies, the pyrenoids, and glistening

FIG. 1.



A thread of *spirogyra majuscula* in its natural state, as seen under the magnifying power of a No. 8 Leltz objective with No. 4 eye-piece.

FIG. 2.



A drawing from nature under the magnifying power of a No. 8 Leltz objective with No. 4 eye-piece, showing the changes occurring in the *spirogyra majuscula* when it dies and decays from nature's own cause.

FIG. 3.

Spirogyra majuscula as seen in normal condition by the aid of the magnifying power of a No. 8 Leltz objective and a No. 4 eye-piece.

granules. The cell protoplasm is somewhat granular, and the protoplasmic streaming can be distinctly seen with a high magnifying power. The form of the nucleus varies with the species; in the *spirogyra majuscula*, the most suitable for this work, the nucleus is irregular in outline, being suspended in the central protoplasmic mass from which radiate protoplasmic threads; it has a nucleus and is slightly granular; in other varieties the nucleus is oval and has the appearance of a bi-convex lens.

The *spirogyra* can be easily cultivated in the ordinary hydrant water. Care should be taken that the water be allowed to flow for some minutes

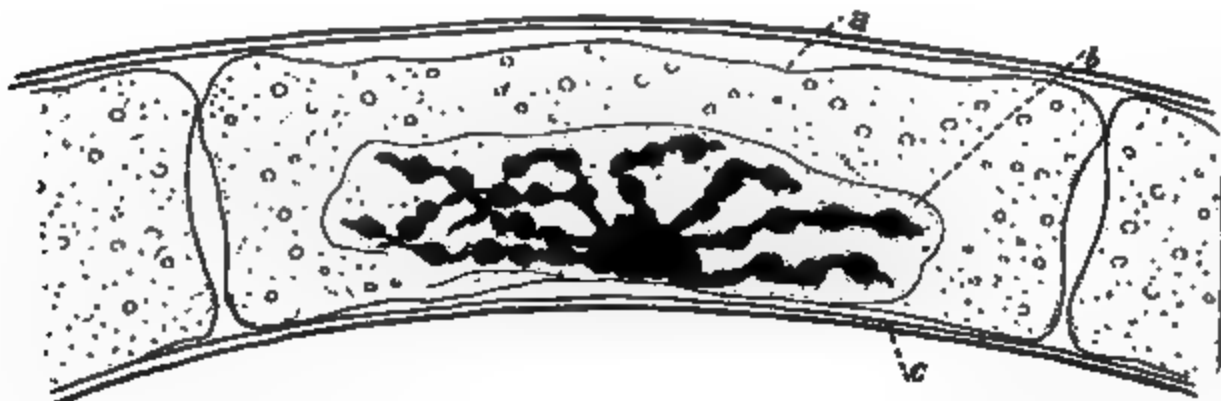
before using, to avoid that water which has been standing in the metal pipes (usually copper or lead), that contains poisonous metals which will destroy the spirogyra.

Carl von Naegeli described in a paper published some years ago (*Ueber die Oligodynamischen Erscheinungen an lebenden Zellen*)¹ a

FIG. 4.

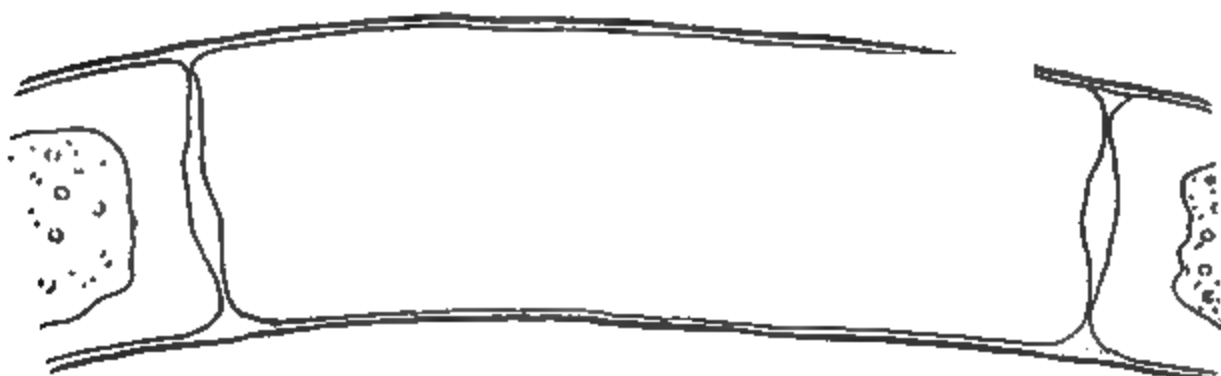
The same specimen as shown in Fig. 3 after treating it with toxic blood obtained from a patient suffering from so-called idiopathic epilepsy. a. Outer protoplast intact. b. Inner protoplast retracted.

FIG. 5.



Spirogyra majuscula showing the retraction of both the inner and outer protoplast, the result of continuous action of toxic blood diluted with 100 parts of water. a. Outer protoplast. b. Inner protoplast. c. Cell wall.

FIG. 6.



Spirogyra majuscula, showing retraction of the whole cell-contents, produced by the action of a 20 per cent. solution of sodium chloride.

variety of changes occurring in the spirogyra by treating the algae with toxic substances, and distinguished three different special forms.

The first he found to be identical with those changes occurring in the cells when they die and decay from nature's own cause, especially those

¹ Neue Denkschriften der allgemeinen schweizerischen Gesellschaft für die ges. Naturwissenschaften. Band xxxiii., Abth. 1.

of in-door cultivation; the whole contents of the cell with the protoplasmic tube retracts slightly from the cell wall; the chlorophyl bands change in color and form without changing their relation to each other; the protoplasm becomes cloudy and granular; the nucleus, formerly oval and situated in the centre of the cell, takes on a rounded form and moves toward the periphery; this was brought about by treating the spirogyra with a weak alkaline solution of silver nitrate (1AgNO_3 , 1NH_3 , and $3.6\text{K}_2\text{O}$ in 100,000 parts of water).

The second was the same as that caused by chemical reaction; the chlorophyl bands retract from the protoplasmic tube; they become shorter and form clumps of chlorophyl; the nucleus falls to one side, and usually disappears. This may be produced by a more dilute solution of the same poison.

The third, a pathological condition, which Naegeli termed "*Oligodynamischen Erscheinungen*," produced by infinitesimal amounts of toxic substances, such as copper, silver, lead, zinc, and mercury. These changes consisted of a retraction of the chlorophyl bands, displacement and deformity of the nucleus, and later retraction of the protoplasmic cylinder.

For the sake of becoming familiar with the methods of Naegeli, and gathering information in regard to the different reactions, the author, in connection with O. Israel, of Berlin, repeated Naegeli's experiments with somewhat different results.¹ To reproduce the pathological changes which Naegeli described, the author used pure metal foil. This is preferable, because it can be easily cleaned and there is less danger of contamination with other substances. A piece of copper foil, about three inches by two, was placed in a quart of hydrant water and allowed to remain undisturbed for twenty-four to thirty six hours; at the same time another quart of water was drawn from the hydrant and placed beside that containing the copper to be used as a control. A small quantity of water was taken from each jar and placed into separate glass dishes or watch-crystals. Several threads of spirogyra were then placed into each dish; after a few moments the specimens were examined under the microscope (No. 7 Leitz objective). It was observed that those threads taken from the water which had been treated with the copper foil were markedly changed, while those taken from the other dish remained intact. It was noticed that in the copper treated specimen a division of the protoplasmic cylinder had taken place, the inner more delicate portion having retracted and with it the chlorophyl bands, while the outer thicker part retained its original position. If the action of the poison was allowed to continue the latter also

¹ Israel and Klingmann. Virchow's Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, 1897, vol. cxlvii.

retracted, leaving the cell wall perfectly transparent. The different stages of this process may be observed by placing the specimen on a glass slide with a few drops of the copper water, covering it with a thin cover glass and applying a No. 7 Leitz objective. The first change that will be noticed is cessation of the protoplasmic streaming, the protoplasm becomes granular, and then follows the division of the cylinder with nuclear changes, and finally retraction of the outer portion of the tube and destruction of the chlorophyll bands.

In recent investigations the author has found that the same pathological conditions just described can be brought about by the action of various bacterial toxins and toxic blood-serum, while those changes mentioned under one and two as chemical and physiological reactions will occur when these delicate structures are treated with solutions of inorganic salts of varying strengths.

In studying the conditions of the blood, especially its toxicity in a great variety of cases, numbering one hundred and fifty, some very interesting changes were noted. About one-third of these were in perfect health, the other two-thirds were patients suffering from various disorders, such as epilepsy, neurasthenia, hysteria, hystero-epilepsy, catalepsy, chorea, acute melancholia and mania, septicæmia, pyæmia, pneumonia, syphilis, tuberculosis, erysipelas, typhoid fever, scarlet fever, diphtheria, measles and other specific infectious diseases, acute and chronic alcoholism, gout and rheumatism.

The toxic condition of the blood was frequently determined by animal experiments, which invariably resulted in convulsions and death of the animal when inoculated with one or two cubic centimetres of toxic blood. The test was then made with the *spirogyra majuscula*. A half to one cubic centimetre of blood is taken from the patient's finger by piercing it and collecting the blood with a small graduated pipette, which has been previously cleansed with glacial acetic acid and thoroughly washed out with hydrant water, and the excess of water remaining in the tube shaken out. The part from which the blood is to be taken must also be cleansed in the usual way. After the blood has been obtained it is diluted with twenty cubic centimetres of water and thoroughly mixed; a few drops of the liquid are placed on a clean glass slide; a thread of *spirogyra* is put into this, and is observed under the microscope with about a No. 3 Leitz objective. This is sufficient for the ordinary changes, but if the finer changes are to be studied a thin cover-glass is placed over the specimen and a No. 7 Leitz objective applied.

It is of first importance that all glass dishes, slides and covers are chemically clean; the *spirogyra* must be handled with bone-tipped forceps, and must not come in contact with metals. The water which is used

for diluting the blood is tested by placing a few threads of *spirogyra* in a glass dish containing some of the water, and is allowed to stand for a few minutes; if the water is non-toxic the specimen remains unchanged. The time in which the change will occur varies directly with the amount of toxin present and the species of *spirogyra* used. In one case it was found that the reaction took place after diluting the blood with five litres of water. In this way it can be determined whether the toxicity of the blood has increased or diminished. It was repeatedly observed that in testing the blood of patients who were convalescing the time in which the reaction took place was greatly prolonged; in one case of diphtheria this was noticed after two injections of antitoxin. In all cases examined, except those suffering from acute and chronic alcoholism and gout and rheumatism, a division of the protoplast of the *spirogyra* took place; in the cases of alcoholism, rheumatism, and gout the reaction was not the same as that occurring in the other cases, but resembled that described by Naegeli under the second heading; the chlorophyl bands were retracted from the protoplasmic cylinder and changed their general arrangement, and the nucleus changed its position and form.

The blood of fifty persons in perfect health was repeatedly examined, with negative results. One cubic centimetre of blood was diluted with five cubic centimetres of water and placed in a small glass dish; a few threads of *spirogyra majuscula* were put into this and allowed to stand for several hours; after this a microscopical examination was made, which revealed that the *spirogyra* were still in normal condition, and that protoplasmic streaming was present and of normal rapidity; the nucleus retained its natural position and form—in fact, no change whatever could be detected with a high magnifying power. Several guinea-pigs were inoculated with blood-serum from these cases without the slightest disturbance, and at the present writing the animals are still living.

To study the action of toxic blood on animal protoplasm the author instituted another series of experiments, and for this purpose a very low class of protozoa was selected. The rhizopodæ are very suitable, on account of the nudity of the protoplasm, and very satisfactory results were obtained. The special forms used were the *amœba*, *diffugia oblonga*, *hæmatococcus pluvialis*, *paramæzium bursaria*, *spirostimum ambiguum* (Ehrbg), *vorticella microstoma*, and *stylongchia mytilus*. These were treated with toxic blood in the same manner as the *spirogyra* and invariably ended the experiment in the destruction of animal life; considering the great morphological difference in the well-protected plant cell and the practically nude animal protoplasm, the action of the toxin may be regarded as analogous.

Very interesting were the changes in the hæmatococcus when treated with toxic blood. At first the movements of the cilia became markedly slower and, in consequence, locomotion was retarded, and after a few minutes complete cessation of motion occurred; the cilia appeared shorter and thicker; the oval body became round and somewhat enlarged; the whole organism took on a uniformly green color, and its definite structure could no longer be recognized. In the case of the paramæcium all movement ceased after three minutes' action of toxic blood obtained from a patient suffering from catalepsy. With other forms the same general results were obtained.

In treating these organisms with normal blood no change was observed in their structure, and they remained active indefinitely.

To eliminate the possibility of an error in the method, or contamination of the water with other substances, all the experiments were carefully controlled by placing in a portion of the water which was employed for diluting the toxic blood a specimen of the material used for making the test, and after several hours or even days the specimens remained unaltered, while if the toxic blood was added a change occurred in from one to twenty minutes, according to the amount of toxin present.

Ordinary distilled water cannot be used for diluting the blood, and if used must be redistilled from glass retorts. The author has frequently found that distilled water obtained from chemical laboratories has a slight acid reaction, and will produce those changes of pure chemical action in the algæ.

In the course of the above experiments it was observed that the protozoa and algæ succumbed to the action of toxic blood of patients suffering from functional nervous disorders quite as rapidly as to that of specific infectious diseases. This is in accordance with the theory of auto-intoxication and may aid us in the treatment of the so-called functional disorders. What this poison may be we cannot at this time ascertain, but that it exists will not be denied. Considering the uniformity with which the reactions in the above experiments occurred, the small amount of toxin required to cause the change, and the easy application of the method, this may be regarded as a delicate, reliable, and practical test for toxic states of the blood.

THE ROLE OF THE ALLOXURIC BASES IN THE PRODUCTION OF THE CARDIO-VASCULAR CHANGES OF NEPHRITIS.

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HYPERTROPHY of one or both ventricles, with or without dilatation, and increased arterial pressure are found in many cases of nephritis and in various lesions of the kidneys associated with destruction of parenchyma.

Of the theories promulgated in explanation of this phenomenon only two merit serious consideration, viz., the mechanical or physical theory created by Traube¹ and the intoxication or retention theory originated by Bright.²

Traube's mechanical theory is readily disproved. He postulates that two factors in nephritis cause increase of arterial pressure with resulting hypertrophic changes in the heart and bloodvessels, viz.: 1. The obliteration of numerous bloodvessels in the contracted kidney, parenchyma, or their compression by exudate in acute inflammation. 2. The increase of the quantity of fluid in the arteries as a result of the decreased abstraction of water by the reduced or diseased kidney parenchyma.

These premises are fallacious: First, because increased resistance in the renal arteries does not produce increased blood pressure, as has been conclusively demonstrated by Ludwig, who failed to obtain increased aortic pressure after ligation of both renal arteries. Second, because a diminished excretion of water with resulting plethora would not cause the aortic pressure to rise; experimental injections of physiological salt solution, causing an excess of fluid in the arteries, do not produce a rise of pressure, for the reason that the arteries equalize the blood pressure by their vasodilator mechanism. Third, because in that form of nephritis in which cardiac hypertrophy is most frequent, chronic (primary) interstitial nephritis, the excretion of water is not only not decreased, but, on the contrary, increased from the very beginning. Fourth, because the arteries are capable of getting rid of excessive water through other channels than the kidneys.

Bright's retention theory postulates that in nephritis certain excrementitious substances are poured into the circulation that by exercising either a direct cardio-excitatory action cause hypertrophy of the heart, or by producing constriction of terminal arterioles and capillaries throw additional work on the heart muscle and thus cause enlargement.

For those inflammatory forms of nephritis in which the heart changes are manifestly secondary to the kidney lesions, where we have the sequence—diminished excretion of urine, increase in arterial pressure, hypertrophy of the heart—no other explanation than the one given by Bright seems possible. The one undetermined factor remains: the nature of the substance or substances that are capable of producing the increased arterial pressure.

In primary interstitial nephritis (syn.: primary contracted kidney, granular atrophy of the kidneys, primary indurative sclerotic kidney, "gouty" kidney, lead kidney, "primäre genuine Schrumpfniere," etc.), however, in which hypertrophy of the left ventricle is found in from 50 to 90 per cent., retention of excrementitious substances does not occur except in the last stages. The cause of the cardiac hypertrophy must here be sought for outside of the kidneys.

Of the substances that are normally excreted by the kidneys and that in disease of these organs are retained, urea is the only one that has been physiologically tested for its effects upon arterial pressure, the arterial coats, and the heart. Ustimovitsch,³ Grützner,⁴ von Cavazzani and Robustello⁵ injected urea into the blood and observed arterial spasm and a rise of blood pressure. O. Israel⁶ fed rabbits with increasing doses of urea and produced both "hypertrophy of the heart and of the kidneys."

While investigating the rôle of uric acid and its congeners, the alloxuric bases, in the causation of so-called uric acid lesions ("Uric Acid Theories," etc.,* "An Investigation into the Causes of So-called Uric Acid Lesions," etc.†), a series of physiological tests were carried on with the latter group of excrementitious substances. It was found that they are capable of producing, first, marked anatomic changes in the kidney parenchyma, consisting in granular and fatty degeneration of the epithelial cells lining the tubuli contorti; second, a proliferation of the endothelial cells lining the intertubular capillaries. Gaucher,⁷ in his investigations on toxic nephritis, had chronicled similar findings ("néphrite épithéliale"). Kolisch and Tandler⁸ repeated his experiments and corroborated them ("Granular Atrophy").

The production of an endarteritis in the renal arterioles by the alloxuric bases led us to investigate the effect of these substances on the systemic bloodvessels, the heart and the arterial pressure, with a view of determining what, if any, rôle these excrementitious bodies played in the causation of the cardio-vascular changes so frequently observed in nephritis.

* Journal of American Medical Association, July, 1899.

† New York Medical Journal, August, 1900.

The alloxuric bases are, in contradistinction to uric acid and urea, very readily soluble in the tissue fluids, and possess highly toxic properties. They are found in normal urine in appreciable quantities—up to 0.06 gr. in twenty-four hours—and their formation and excretion or retention are greatly increased in a variety of morbid conditions. Their chief representatives are xanthin, hypoxanthin, adenin, and guanin.

Ten rabbits were subjected to daily hypodermatic injections of 1 c.c. of watery, slightly alkaline solutions of xanthin and hypoxanthin (the most readily procurable of the alloxuric bases), in concentrations of from 0.05 to 0.5 per cent. for xanthin and from 0.2 to 0.7 per cent. for hypoxanthin for different periods of time. In all rabbits the typical nephritis was produced, varying in intensity with the strength of the injections and the length of time during which they were administered.

Albumin appeared in the urine in from five to forty-two days. As the nephritic changes have been fully discussed in two previous publications mentioned above, their occurrence is herewith simply chronicled.

The following lesions of the cardio-vascular system were observed :

1. THE ARTERIAL PRESSURE. In the carotid of the rabbit the blood pressure is normally capable of supporting a column of mercury of from 60 to 90 mm. in height.

Animals I. and II.—In two rabbits of our series the carotid pressure was determined immediately after the first injection of 1 c.c. of a 0.3 per cent. and of a 0.5 per cent. solution of xanthin. In the first instance the manometer registered 104 mm., in the second instance 109 mm.

Animals III. and IV.—Two rabbits received injections of xanthin solution of 0.3 per cent. for six weeks. The manometric determination was made on the forty-second day, and twelve hours after the last injection the manometer registered from 107 to 108 mm. in one animal, and 109 mm. in the other.

2. THE ARTERIES. Endarteritic changes corresponding to those found in the intertubular arterioles of the kidneys—*i. e.*, simple proliferation of the endothelium—were discovered in Animals III. to VIII.

In Animals IX. and X., where comparatively small doses of xanthin and hypoxanthin were administered for a long time, truly atheromatous changes were seen, consisting in small-celled infiltration of the intima and adventitia, with thickening of the intima and the appearance of necrotic tissue in different areas of the vessel walls. The muscularis, by comparison with the muscularis of two normal rabbits killed for control, appeared slightly hypertrophic.

3. THE HEART. Eight of the rabbits were subjected to injections of xanthin and hypoxanthin for a period of from forty-two to one hundred and ten days. In all these animals cardiac changes were determinable.

Animals III. and IV.—Two were killed at the expiration of forty-two days. In these, as stated above, the blood pressure supported 107 to 109 mm. of mercury. Nutrition was good, the animals were not emaciated. A concentric hypertrophy of the left ventricle was found. The right heart, the endocardium, pericardium, and myocardium were normal.

Animals V., VI. and VII.—Three rabbits were killed at the expiration of fifty-two, seventy-one, and eighty-nine days respectively. Daily injections of 1 c.c. of a 0.7 per cent. solution of hypoxanthin. In two (seventy-one and eighty-nine days) emaciation was extreme, and they were moribund when destroyed. In these hypertrophy and dilatation of the left ventricle and dilatation of the right ventricle were found. The myocardium showed degenerative changes. The third animal (fifty-two days) showed hypertrophy and dilatation of the left ventricle and no changes in the right heart nor in the myocardium.

Animal VIII.—One rabbit suffered daily injections of 1 c.c. of a 0.7 per cent. solution of hypoxanthin. On the fifty-fifth day the animal fell acutely sick, and died on the sixtieth day. Autopsy revealed sepsis. The left ventricle was hypertrophied and dilated.

Animal IX.—One rabbit was killed on the one hundred and tenth day. Daily injections of 1 c.c. of a 0.2 per cent. solution of hypoxanthin. Simply hypertrophy of left ventricle.

Animal X.—For a period of six months (one hundred and eighty-two days) received 1 c.c. of a 0.5 per cent. solution of xanthin twice daily. When killed was apparently in good health and well nourished. The heart, however, was greatly enlarged in all diameters. Both left and right ventricles were hypertrophied. No dilatation could be positively determined. Endocardium, pericardium, and myocardium were sound.

From these experiments we draw the following conclusions: Xanthin and hypoxanthin are capable of producing a rise in arterial pressure which may be due to arterial spasm, increased heart action, or both.

In view of the presence of endarteritic changes in the arteries and the absence of corresponding changes in the endocardium, we are inclined to the hypothesis that the primary effect of the alloxuric bases is exercised on the arteries, causing spasm. As a result increased work is thrown upon the heart, causing primarily hypertrophy of the left ventricle.

As long as nutrition remains good—*i. e.*, as long as the intoxication is not so violent or so long lasting as to produce degenerative changes of the heart muscle—no dilatation supervenes. *Per contra*, owing to the increased determination of blood to the coronary arteries

(as a sequence of the hypertrophy of the left ventricle), the nutrition of the whole heart is ameliorated and the right ventricle hypertrophies. This hypertrophy of the right ventricle might be explained in a different manner—*i. e.*, as a result of spasm of arterioles of the pulmonary circulation. We know, however, that the pulmonary vessels do not respond to stimuli as vigorously as the systemic arterioles (Senator⁹), so that the latter explanation is not sufficiently grounded in fact. As soon as the nutrition of the heart grows defective, dilatation of one or the other or of both ventricles occurs.

Xanthin and hypoxanthin, therefore, representative members of the group of alloxuric bases, are capable of producing the cardio-vascular changes in those forms of nephritis in which retention of excrementitious substances *precedes* the lesions of the heart and arteries.

In the production of the hypertrophy of the heart so frequently seen in the primary interstitial form of nephritis, where the retention theory does not hold good, they also play an important rôle in a slightly different sense.

The three chief causes for this primary form of indurative sclerosis of the kidneys are (1) the so-called uric acid diathesis (gout); (2) lead, and (3) arterio-sclerosis. The rôle of syphilis, alcohol, and of diabetes mellitus is not universally recognized.

1. THE GOUTY FORM OF INTERSTITIAL NEPHRITIS. In our previous publications on the rôle of the alloxuric bases in the production of so-called uric acid lesions we have demonstrated, we believe conclusively, that the alloxuric bases are the primary factor in the causation of "gouty" kidney and of the majority of the symptoms of the gouty diathesis. In the gouty form of primary interstitial nephritis, therefore, the same poison that produces the kidney lesion causes the cardio-vascular changes.

2. THE "LEAD" FORM OF INTERSTITIAL NEPHRITIS. Lead intoxication can produce both the typical nephritis and in very chronic cases other symptoms of gout, so-called spurious or lead gout. We must conclude, therefore, that the toxic action of lead is either identical to that of the alloxuric bases or that lead is capable of causing metabolic changes in the organism which lead to the formation of alloxuric bases. These in their turn, as above, cause cardio-vascular, nephritic and gouty symptoms. Certain changes in the blood, "lead chlorosis," characterized by evidences of deficient oxygenation and of excessive nuclein katabolism, important factors in the generation of the alloxuric bases, lead us to favor the latter supposition.

3. THE ARTERIO-SCLEROTIC FORM OF INTERSTITIAL NEPHRITIS. The inter-relationship between arterio-sclerosis and induration of the kidneys may be threefold, viz. :

(a) Arterio-sclerosis may be primary, the induration and atrophy of the kidneys secondary; "true sclerosis of the kidneys."

(b) As a result of parenchymatous nephritis with retention of excrementitious substances, both hypertrophy of the heart and arterio-sclerotic changes in the arteries may occur. In this case the nephritis is primary, the "arterio-sclerosis" secondary.

(c) The same toxins may simultaneously produce both the nephritis and the arterio-sclerosis (lead, gout, etc.).

Arterio-sclerosis is, therefore, only in isolated instances the cause of the nephritis. In the majority of instances, where the two conditions are found together, the arterio-sclerosis stands in no causal relationship to the nephritis, but is either a result or a concomitant feature. Where arterio-sclerosis is primary it usually constitutes a senile change. In all other forms it will be found that some kidney lesion coexists and that we are dealing with one of the forms described under (b) and (c).

Our investigations, therefore, justify us in attributing to the alloxuric bases an important rôle in the production of the cardio-vascular changes observed in *all* forms of nephritis with the exception of that chronic indurative form sometimes seen as a result of senile arterio-sclerosis.

A series of investigations, finally, instituted with varying doses of uric acid for different periods of time (see previous publication, Experiments I. to VIII.), revealed that uric acid is altogether without effect on the blood pressure, the arteries, and the heart.

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REVIEWS.

THE PRACTICE OF MEDICINE. A TEXT-BOOK FOR PRACTITIONERS AND STUDENTS, WITH SPECIAL REFERENCE TO DIAGNOSIS AND TREATMENT.
By JAMES TYSON, M.D., Professor of Medicine in the University of Pennsylvania, etc. Second edition. Philadelphia: P. Blakiston's Son & Co.

COMING from a man of large experience, and bearing evidence of careful and conscientious preparation, well arranged, thoroughly practical, and up to date, it was only natural that the first edition of Dr. Tyson's work should have received a warm welcome from teachers, practitioners, and students.

This is in good faith a new edition. Buyers of books in this country are beginning to be a little shy and suspicious of so-called new editions. Three or four thousand copies of a work are exhausted in the course of a year or two, and the publisher calls upon the author to prepare what is termed a new edition. It is put upon the market, and one finds here and there a line or two of new matter, and the typographical errors corrected. We had occasion some years ago in reviewing Loomis' *Practice of Medicine* to call attention to this pernicious practice, to which authors should not lend themselves. In a *bona fide* new edition the articles should be really revised and in part rewritten, and important new matter should be incorporated. This edition of Dr. Tyson's work is of the right kind. A good deal of space has been gained by putting the historical matter in small type; this, by the way, is a very interesting feature of the book, as some of the sections are unusually well done, as, for instance, the note on appendicitis, which is exceptionally full and clear.

In the article upon typhoid fever we find much new matter, and the picture of the disease is well drawn and faithful to nature. We miss a reference to the valuable lessons of the Spanish-American war. The recent investigations upon the typhoid bacilli in the urine and in the gall-bladder are fully considered. The section on treatment is admirable. Dr. Tyson is conservative in the matter of diet, and while he quotes at length Dr. F. C. Shattuck's diet list, which is unusually liberal, he is, we think, safe in refusing to allow during the febrile stage such articles as minced meat, scraped beef, or soft toast. Hydrotherapy is advocated, either the full tub or the pack or the cold sponging. While he deals with the question of laparotomy in perforation, and advocates it early, the signs of perforation, which are so notoriously uncertain, deserve a fuller consideration. While a strong advocate of the tub, Dr. Tyson gives full consideration to the antiseptic and eliminative methods of treatment. In dealing with the specific treatment by the cultures, the work was probably too far advanced to give the results of preventive inoculation obtained by Wright in South Africa.

Dr. Tyson evidently considers that the mosquito theory is rapidly gaining evidence sufficient to warrant its acceptance. We need a much fuller study of the clinical features of the remittent fevers of this country, particularly with frequent observations on the temperature and simultaneous blood study by men who are really experts. Marchiafava and Bignami's article in the *Twentieth Century Practice* helps in part to clear up the confusion, and will be a very great help to students of the disease. There is a very good section in Tyson's work on the malarial hæmaturia, and he takes the ground that quinine cannot be held to be responsible, remarking that had he hæmoglobinuria he would prefer to be treated by quinine.

Turning to the important subject of yellow fever, Sanarelli's claim is discussed, and the only conclusion at present possible is arrived at that the etiological question is by no means settled. It is to be hoped that the work of the new commission in Cuba and of the Liverpool Tropical School Commission in Brazil will settle finally the question of the bacillus icteroides. The article is much extended.

In the article on measles there is a beautiful plate illustrating Koplik's sign.

The authors of text-books are, as a rule, busy practitioners, and we know some of them who have not even time to read the journals; still, they should feel in a measure bound to keep *au courant* with the progress of a disease in their own country. It would have added very much to the interest of the article on smallpox if Dr. Tyson had referred to the really very remarkable epidemic that has been prevailing throughout the United States during the past two or three years. It had a number of very strange features—so strange, indeed, that there were good practitioners who denied that it was variola.

The question of lumbar puncture is carefully considered in cerebrospinal fever, with an excellent chart illustrating the procedure. It is advocated, also, as a therapeutic measure. In the consideration of this disease all the new points are very well discussed.

There is a good account under dysentery of the recent studies of Shiga and Flexner upon the bacillus dysenteriae.

The article on the bubonic plague is much extended, and full directions are given for the use of Haffkine's prophylactic.

This edition contains a new section upon the gonorrhoeal infection, which has important medical relations.

A good change is the consideration of tuberculosis as a unit under the infectious diseases. It gives the student a much better conception of the whole process of the disease to take it up in this comprehensive manner.

The subject of pneumonia is transferred from the section on diseases of the lungs to the section on infectious diseases.

To one or two other prominent diseases we may refer.

In the first edition the subject of appendicitis was treated with clearness and with judgment. Living in a town in which the diagnosis of appendicitis is very often made by telephone, and in which the surgeons apparently have a monopoly in the right iliac fossa, Dr. Tyson has not perhaps appreciated that the pendulum has been swinging a little toward conservatism, and that we are beginning to realize that the disease does not require operation in every case. Still his position, as stated in a new paragraph, is admirably put: "The diagnosis being

thoroughly established, operative treatment should be deferred only long enough to determine whether symptoms will subside under rest. If they do not subside, operate at once. If they subside in a degree without disappearing, also operate. If they subside completely in twenty-four to forty-eight hours, do not operate until recurrence, then operate at once."

Under diseases of the gall-bladder a section on acute cholecystitis would have helped to call the attention of surgeons and practitioners to a condition by no means infrequent, and which, as Maurice Richardson has taught us, is very apt to be overlooked.

In section 5, preceding the consideration of diseases of the blood, there is a very full account of the minute structure of the blood, occupying nearly four pages. Except, perhaps, for the general practitioner who likes to have a text-book of medicine a sort of cyclopædia, this seems hardly necessary; certainly, it is superfluous for the student. Under pernicious anæmia there are two new cuts illustrating the iron pigment in the liver.

Dr. Tyson has been so long recognized as an authority on diseases of the kidneys that we naturally expect this section to be of special weight. He has altered slightly the arrangement of the subject of albuminuria, and has added several pages on renal dropsy, uræmia, and tube-casts. The division of the important diseases of the kidneys into acute parenchymatous, chronic parenchymatous, and interstitial nephritis remains as in the first edition. On the subject of renal stone he lays stress on the aid to diagnosis of the X-rays.

In the revision of diseases of the nervous system, Dr. Tyson has fortunately had the co-operation of Dr. William G. Spiller, than whom the profession possesses in this country no better student of the subject. Turning to locomotor ataxia, from which, perhaps, better than from any other disease one can learn an author's stand-point in nervous diseases, we notice that the good old name has been replaced, and we think correctly, too, by *tabes dorsalis*; but the synonym *locomotor ataxia* is not given, and, strange to say, neither under A nor L does it occur in the index. This reminds one of Dr. Foe's well-known *Shortest Way with Dissenters*; if you wish to get rid of a word and to stop the use of it by students abolish it altogether, and do not use it yourself. There is not much change in the article, and one is a little disappointed at not finding a fuller discussion of the relation of the disease to syphilis and of its close relationship with general paresis. Under treatment some description of Fraenkel's movements might have been inserted. There is a new and good section on ataxic paraplegia. One misses any reference to the remarkable condition of myasthenia gravis. There are several fresh illustrations of the cortical speech areas. The cut of the circle of Willis and the description of the arteries are surely superfluous. In the discussion of the subjects of anæmia and hyperæmia Geigel's researches have apparently not been incorporated. But these are minor points, and do not mar in any way the great merits of the book as a thoroughly trustworthy guide for practitioners and students in the science and art of medicine.

Again P. Blakiston's Son & Co. have set the pace in the matter of typography. There is no text-book of medicine on the market of so attractive an appearance.

E. Y. D.

LECONS DE CLINIQUE MÉDICALE. Par Le DR. J. VIREZ, Professeur Agrégé à la Faculté de Médecine de Montpellier, Médecine de l'Hôpital Général, Chargé du Cours de Clinique des Maladies des Vieillards. Pp. vii. 245. Montpellier: Coulet et Fils, 1900.

LECTURES ON CLINICAL MEDICINE.

THE charm of printed lectures often outlives the lecturer. An accurate description of disease as it offers itself to the audience, fixed by the truthful delineation of the experienced and careful demonstrator, may serve, decades later, to assist in a new classification or to indicate a new therapy. To-day the lectures of Charcot, to which we listened many years ago, recall the vivid description, the earnest presentation, and the logical deductions of the great master, and reading and re-reading are always a source of pleasure and profit. The author with his extensive field, more especially in the diseases of old age, has given us an instructive account of Basedow's and of Parkinson's disease, facial paralysis, syphilitic myelopathies, myxœdema, and gastric crises as he has met with these diseases and syndromes. So far as he has gone—and no attempt has been made to cover more of the field by internal medicine than is indicated above—his lectures bear internal evidence of their actuality. While nothing of novelty can be claimed, yet in their presentation they show a high order of merit. Our Gallic colleagues are frequently open to the criticism that their published lectures are diffuse and abound in repetitions, but to these objections we can state that the volume before us is not open. If it is wanting in any particular, it is that therapy is not sufficiently prominent nor extended. The work shows wide reading and that of literature, not by his own speech, if the reference to Bryson's sign (p. 2) be a proof. At times we could wish for an expression of more pronounced personal opinion, for instance, as to the rôle of the thyroid in exophthalmic goitre. And we hardly think the writer has clearly in mind the relation of myxœdema to acromegaly (p. 185). A brief résumé on "Morbid Antagonism," by Salager, closes the volume.

R. W. W.

INTERNATIONAL CLINICS. Edited by HENRY W. CATTELL, A.M., M.D., Director of the Ayer Clinical Laboratory of the Pennsylvania Hospital, with the collaboration of JOHN ASHHURST, JR., M.D., LL.D.; CHARLES H. REED, M.D., and JAMES T. WHITTAKER, M.D., LL.D. Tenth Series, vol. i., pp. xiii. 315; vol. ii., pp. x. 300. Philadelphia: J. B. Lippincott Company, 1900.

THE *International Clinics* have been so long before the medical world that comment or criticism may seem to be unnecessary. The reviewer might readily close his notice with the statement that they still maintain a high standard. But while this is true there comes also a feeling of congratulation that in so far as these represent actual lectures the standard of instruction is being gradually but slowly raised. And just so far as they present modern ideas these ideas are resting upon the more secure basis of exact science. Naturally the various lectures are of different degrees of excellence—the "articles especially prepared" do not belong to the title—but all possess some degree of interest. "The

Progress of Medicine during the Year 1899," which occupies more than one hundred pages, would better be left to the year-books. The seven pages devoted to the Philadelphia Hospital Formulary, which also contain therapeutic notes, seems hardly in place in this work. The prescriptions are scarcely examples of elegant prescribing, and the matter is chiefly interesting to those engaged in dispensary work. The paper on "Camp Management" is particularly commended; the one following upon "Typhoid Fever Among the Troops at Chickamauga in 1898" gives an excellent presentation of how matters should not be attended to, and revives history which cannot but be a source of mortification to all who are proud of American medicine. The responsibility for such terrible neglect has been fixed, but no official condemnation has followed. In Volume II. there is much to commend. The dreary catalogue of papers read before the American Medical Association at the 1900 meeting possesses but little interest save to those participating in the proceedings. Of notable improvements which directly affect medicine is the Kromskop, and the paper describing it should be read with appreciation. Taken as a whole, this volume is excellent. So far as these volumes adhere to the original plan they are worthy of commendation in that they present truthful pictures of diseases and their treatment. The brevity of most articles permits their being read at odd moments when serious and sustained study is impossible. Keeping this in view, the authors have rendered a real service to medicine, and deserve the recognition which their effects have hitherto received. The series bears internal evidence that the standard of teaching is still more satisfactory, and we predict continued and deserved success.

R. W. W.

SYPHILITIC DISEASES OF THE SPINAL CORD. By R. T. WILLIAMSON, M.D.
Manchester: Skerratt & Hughes, 1899.

THIS book is scarcely more than a thesis. It is written in the ordinary text-book style, with a few references appended to each chapter. The author appears to be very fond of classifications. He gives the notes of a few cases that have not hitherto been reported, among others three cases of syphilitic meningitis, a case of acute syphilitic paraplegia, and one of gumma of the cord. There are a few noteworthy statements, particularly the following: "When the temperature sense is affected the patient may be unable to recognize the difference between hot and cold test-tubes." There is nothing strikingly original, but the subject is well handled. In the preface the author states that it was his intention "to present a more detailed account of spinal syphilis than is generally found in text-books or systems of medicine," and we believe he has succeeded in this. One of the most interesting features of the book is the description of a case in which the symptoms were those of almost complete paraplegia, from which the patient partially recovered. At the autopsy there was degeneration of the pyramidal tracts throughout the cord, but of the posterior columns only as far down as the junction of the cervical and dorsal regions. The author does not offer any explanation for this peculiar distribution, and apparently the posterior nerve roots were not examined.

J. S.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
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AND
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On the Cause of Diabetes Mellitus.—WILLIAMSON (*The Practitioner*, July, 1900, p. 61), in an interesting article on the above subject, publishes some statistics on the etiology and pathological findings in diabetes mellitus, in which, however, little that is new is brought to light.

The writer draws special attention toward the conclusion of his paper, however, to the large number of cases of diabetes in which neither the previous history nor the results of the post-mortem examination throw any light on the causation of the disease. These cases occur most frequently in young persons, and to this particular group Naunyn has applied the term of "pure diabetes."

According to Williamson, two theories as to the actual cause of the diabetic condition in these cases are worthy of consideration:

(1) A number of writers have held that these cases of diabetes, without apparent pathological lesions, are due to hereditary and congenital defect of sugar metabolism. If this be the cause, Williamson asks why the disease does not more frequently arise in young persons under the age of twenty years.

(2) According to the second theory, this group of cases is due to the introduction of some unknown toxic substance into the system. Williamson thinks that this view has not received the attention it deserves. He raises the question whether many cases of diabetes may not be due to the absorption of some poison from the alimentary tract. In favor of this view are the cases which develop in young adults or in children, which run a rapidly fatal course, and in which the history and the post-mortem examination fail to reveal any satisfactory cause.

In this connection, also, reference is made to the possible infectious character of diabetes. There is now quite a large number of cases reported in

which both man and wife have suffered from the disease. The statistics of Betz, Hertzka, Lecorché, Schmitz, Seeger, Külz, and Senator give, when combined, a total of fifty-six instances in which both man and wife suffered from diabetes among 5159 diabetic patients—a little over 1 per cent. Williamson is rather skeptical as to the infectious character of the disease, and seems disposed to attribute the association of diabetes in man and wife rather to their being exposed to the same predisposing influences than to any specific infective agent.

Of great interest is the result of experimental work recently published by Leo. He found that when large quantities of diabetic urine were administered by the mouth or subcutaneously to dogs, that glycosuria was generally produced. The same results followed if the diabetic urine was freed from sugar by fermentation. Normal urine very rarely produced glycosuria when given in the same way. Leo concludes that diabetic urine contains a poison which produces glycosuria when introduced into the system. He thinks that the poison is possibly produced by the action of micro-organisms.

Töpfer showed that the injection of a quantity of the contents of the small intestine of a diabetic patient under the skin of a rabbit produced glycosuria. The intestinal contents of a healthy individual fails to produce the same result.

Töpfer also found that glycosuria could be produced in dogs by the injection into the stomach or small intestines of a portion of the intestinal contents of a diabetic patient. Negative results followed when the intestinal contents of a non-diabetic patient were used.

It would seem, then, that the intestinal contents of a diabetic patient possess the power of exciting glycosuria.

Lépine found that a temporary increase of the amount of sugar in the blood occurs after the injection of a culture of staphylococci into the jugular vein in dogs.

Williamson concludes that whereas these experiments on the intestinal and bacterial origin of diabetes require confirmation, yet they are extremely suggestive when one considers how many diabetics die without any definite etiological factors or post-mortem findings at autopsy.

Pseudochylous Ascites.—MICHELE and MATTIROLO (*Wiener klinische Wochenschrift*, 1900, No. 3) have investigated the cause of the opacity of some cases of chylous ascites in which the fat present was not sufficient to explain the condition. The suggestion of several observers that some proteid body, globulin, seromucoid, casein, etc., might be the cause, the authors show to be undemonstrated. They were fortunate enough to have four cases to study, viz., one of adherent pericardium and cardiac thrombosis, one of pancreatic cancer with metastases in the peritoneum, one of secondary sarcoma of the spleen, and one of cirrhosis of the liver with chronic peritonitis.

The clinical histories are given in abstract, full reports being promised in another place; the results of examinations of the fluids are given in sufficient detail. All the cases showed milky ascites, and the case of hepatic cirrhosis had also milky fluid in the pleural cavities. Without chemical examination the opacity would have been ascribed to fat. It was not altered by filtration, nor by centrifugalization, and ether and caustic potash made

little changes. The ethereal extract of fats—cholesterin and lecithin—was never more than 1 per mille; whereas it requires at least 1.5 per mille of emulsified fat to make a fluid opalescent. The authors finally came to the conclusion that lecithin was the cause of the opacity, the source of the former being readily found in many cells and fluids of the body. By experiment they found that 0.15 gramme of lecithin sufficed to render 1000 c.c. of serous fluid distinctly opalescent. Such an amount was present in the fluids in all the authors' cases. The demonstration that lecithin is the cause of opacity in a fluid containing but little fat can be made by treating some of the fluid with four or five times its volume of alcohol, coagulating the albumin, and warming the mixture on a water-bath to 70° or 80° C., lecithin being soluble in warm alcohol. On evaporating the alcohol the opacity returns again. It still remains to show to what extent lecithin occurs in the true fatty effusions.

[It is hardly necessary to add that the subject is at present of no practical importance, since there is no relation between the milky exudate and any particular anatomical alteration. It seems, however, that in cases with chylous or fatty effusions the precise constituents should be worked out as fully as possible.—ED.]

Cysticercus in the Spinal Cord.—PICHLER (*Prager medicinische Wochenschrift*, 1900, No. 16) reports a case of this kind, only two others being known to him in the literature. The patient, a brickmaker, aged forty-eight years, had multiple cysticerci in the skin and brain, and was sick for one year, with epileptic attacks, dementia, and marasmus. There were no spinal symptoms. The cerebral meninges and the brain contained numerous cysticercus vesicles of various sizes and in different stages. The pons contained two small ones. The cord showed no alteration externally, but at the level of the eleventh dorsal vertebra there was a cysticercus in the posterior columns, and at the level of the first lumbar there was another in the right posterior quadrant of the cord. The upper vesicle had substituted the posterior columns, especially the right, the posterior gray commissure, and the median part of the base of the posterior horn; the central canal was pushed forward and obliterated. Around the vesicle was the usual thick layer of connective tissue and a zone of small cell infiltration. The bloodvessels in the zone frequently contained hyaline thrombi. The lower vesicle occupied the position of the right posterior horn and a narrow zone of the right lateral column. The posterior horn was reduced to a few fibres in each side, and toward the posterior root, where the vesicle reached almost to the periphery of the cord, it had almost disappeared. The wall of this vesicle was thick in places; hyaline thrombi were relatively few, but the wall and its vicinity were much richer in small cells than in the other, showing either more rapid growth or an earlier stage. Above the upper vesicle there was ascending degeneration in the right column of Goll. The lower bladder had caused no such effect. The absence of spinal symptoms can be explained partly by the mental condition of the patient.

Traumatic Diabetes.—J. FRANK (*Prager medicinische Wochenschrift*, 1900, No. 25) reports an instructive case, illustrating incidentally the importance of examining the urine of all patients. A youth, aged nineteen years, had

coxitis from his fifth year, and received various kinds of treatment. In October, 1899, the deformity of the hip was corrected. A month later the plaster dressing was changed and the leg massaged. At this time the patient became much excited, lost his appetite, and acquired an unquenchable thirst. Examined a week later, the patient showed extreme loss of strength; the expression was that of an old man; the tongue dry, red, and fissured; the gums red. The urine had a specific gravity of 1050, and contained 6 per cent. of sugar. Notwithstanding careful dietetic treatment, the patient failed steadily and died four weeks after the shock. The author admits the possibility of a longer duration of the diabetes, with exacerbation from the fright of the dressing, and in the absence of an autopsy admits the possibility of other organic disease [*e. g.*, miliary tuberculosis].

Cancer of the Stomach, with Rapid Course.—LISSAU (*Prager medicinische Wochenschrift*, 1900, No. 25) reports the case of a man, aged twenty-eight years, who for three weeks complained of severe pain in the sacral region, paroxysmal, and increased by motion. Aside from slight elevation of temperature and tenderness to the left of the first lumbar spine, physical examination was negative. There was improvement, so that the patient was discharged, but in three days complained of the same symptoms as before, with a feeling of pressure under the right costal margin, and loss of appetite. There was slight icterus, tenderness in the right hypochondrium and to the left of the lumbar vertebræ. In the next few days the icterus increased, the stools became clay colored; restlessness and emaciation were noted. By the end of the week there was severe icterus, with bloody stools, hæmatemesis, great prostration, and frequent pulse, and in two days more death ensued. The autopsy revealed cancer of the stomach, with metastases in the liver, pancreas, and lymph-glands, and compression of the common duct. Details of the size and position of the primary growth are not given.

Embolism of the Pulmonary Artery.—This lesion is so rarely recognized at the time it occurs that a case observed by DRASCHE (*Wiener klinische Wochenschrift*, 1900, No. 23) will be of interest. The patient, a woman, aged sixty-eight years, complained for several weeks of palpitation of the heart and dyspnoea, and a week before admission had taken to bed with swelling of the legs. The heart was somewhat enlarged, the sounds pure but dull, the pulse arrhythmic, tension moderate, the walls not rigid. The liver was slightly enlarged; the urine scanty, with albumin, but no casts. Both legs were swollen, the superficial veins distended and sensitive to the touch. Repeated examinations of the heart revealed nothing more. Soon after the ward visit, one morning, the patient suddenly had an attack of suffocation, with rattling in the throat, cyanosis, convulsions, spasm of the facial muscles, rolling of the eyes, and loss of consciousness. These symptoms lasted only a few minutes, and the patient was examined immediately afterward. She was not aware of the attack, was still very much cyanosed and collapsed, with cold sweat, anxious expression, slow pupil reaction, the pulse hardly palpable, arrhythmic, about 150. Over the heart, on the sternum, from the second to the third interspace, was a strong, diffuse, systolic thrill. In the same area a long, rough, peculiarly eddying murmur

was audible—systolic, but also prolonged into diastolic, and sometimes apparently double. Severe dyspnoea made accurate observation of this sign difficult. It suddenly disappeared, along with the thrill, and only the dull, uncertain sounds could be heard. Two hours later the patient felt better, complained only of great weakness, was cyanotic, but not dyspnoeic. The heart was irregular; pulse 120, small and weak. Near midnight, fifteen hours after the first attack, another came on, and before the physician reached her the patient was dead. Autopsy showed hemorrhagic infarctions of the lungs, dark red clots in some branches of the pulmonary artery; the right ventricle slightly dilated; mitral valve thickened, but competent; the other valves normal. A thrombus, 4 cm. long and 3 cm. in circumference, filled the main pulmonary artery and obstructed the right branch. In the left branch a tangled thrombus, 1.5 cm. in circumference, completely obstructed the sub-branches. The right iliac vein was filled with a dark red clot, extending into the cava. The right iliac and femoral contained dark-red, slightly adherent clots, containing a firmer, worm-like thrombus, like that in the left pulmonary artery. According to the autopsy, the left pulmonary artery became obstructed first, the clot causing a temporary obstruction as it passed through the right venous ostium. The thrombus in the right branch was so large as to cause death immediately. Although the recognition of the true state of affairs was to a certain extent accidental, the observation is of value in a diagnostic way.

Changes in the Urine after Palpation of the Kidneys.—MENGE (*Münchener medicinische Wochenschrift*, 1900, No. 23) was struck by finding transitory albuminuria in two patients with movable kidneys, after diagnostic palpation. This led him to make careful observations of the urine before and after manipulation on twenty-one patients. Often, though not always, albumin was found in the urine, varying greatly in different cases. In six cases there was no alteration; in fifteen there was albumin up to 0.5 per mille (Esbach). In all cases the albumin disappeared within twenty-four hours, once in three-quarters of an hour. The idea that the albumin depended on a hæmaturia was confirmed in five cases, though the albumin was always more than could be explained by the blood present. In two cases there was also cubical epithelium. Examinations of the bladder with the cystoscope showed that the blood did not come from mechanical lesions of the bladder, and catheterization of the two ureters showed that the abnormal elements came only from the palpated kidney. In one case palpation of both kidneys in turn showed an increase of albumin (estimated) after the second palpation. The author concludes, though with some hesitation on account of the small number of observations, that the appearance and quantity of blood and albumin after renal palpation depend on the force and duration of the palpation, the nutrition of the patient, the tension of the abdominal wall, and the degree of nephroptosis, and also on the "sensitiveness of the palpated organ." He adds some considerations concerning renal pathology that need not be referred to, but makes two therapeutic suggestions that deserve some notice. On the ground of his observations he advises against the massage of the renal region and the use of bandages in nephroptosis. Regarding these points further observations would seem indicated.

SURGERY.

UNDER THE CHARGE OF

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Suprapubic Lithotomy in Old Men with Enlarged Prostates.—THOMAS (*Lancet*, June 9, 1900), in speaking of the post-prostatic pouch so frequently found in cases of enlarged prostate, says that it is frequently the seat of calculus formation, and that calculi may remain in such pouches for months without causing cystitis or notable symptoms. The symptoms in some of his cases have been so slightly different from those of enlargement of the prostate that the existence of the calculi could have been, and most often has been, overlooked. Slightly increased frequency of micturition and occasional pain may attract attention; in one case a little blood was noticed in the urine on one occasion. Catheter life will generally lead to cystitis, with increased pain and some blood from the rough phosphates that collect on the surface of the calculus. When in cases of enlarged prostate with any degree of residual urine the symptoms become in any way exaggerated it is well as a routine practice to sound for stone, and if the prostate be very large to use a special sound (Kane's) or the cystoscope to explore the pouch behind the middle lobe. These calculi often escape the ordinary sound or aspiration sounding. The strictest antisepsis in the washing out of the urethra and bladder should precede all these examinations.

Of the choice of operation Thomas says: "The objections to crushing in these cases are: (1) The difficulty, or even the impossibility, of seizing the calculus; (2) if caught and broken, then the difficulty in finding the fragments; and (3) granted the possibility of crushing, then aspiration, diffusing the fragments into innumerable bits in the mucous membrane, the great uncertainty of washing out all the pieces, for in these cases the patient cannot be trusted to pass any portions left behind; they will lodge behind the prostatic enlargement and form nuclei for fresh calculi."

The difficulty of seizing the calculus was illustrated by some of the author's cases and by the statistics of lithotrities, which show how often recrushing has to be done because the fragments were not all washed out and new calculi form. "Perineal lithotomy is not applicable, owing to the great increase in the depth of the perineum, to such an extent in some cases that neither finger nor forceps can reach the stone. The suprapubic operation, carried out with modern precautions, is simple and almost bloodless; it enables the bladder to be thoroughly explored and allows of the extraction of the cal-

culus and of treatment of the enlarged lobe if thought advisable. It becomes the procedure of choice in the cases under consideration. Further, the bladder can be sutured and the wound treated antiseptically.

“ Before resorting to operation it is advisable to render the urine and urinary tract as sterile as possible. If cystitis with ammoniacal urine be present, the administration of urotropine in five-grain doses thrice daily, and washing out the bladder with chinosol lotion (1:1200) twice a day or oftener, have answered best in my experience. Boric acid is much too feeble an antiseptic if the urine be ‘ high.’ Chinosol is non-poisonous and a powerful antiseptic. It is imperative that every aseptic and antiseptic precaution should be taken in urethral and bladder surgery; to do so means absence of rigors and complications. There is an idea prevalent that any catheter from an old drawer or hand-bag smeared with that abomination carbolic oil will do. The catheter should be boiled or steamed, the glans penis should be thoroughly cleansed with chinosol lotion, and the urethra should be washed out with the same. The lubricant used is a mixture of soft soap, glycerin, and water in proportions of eight, six, and four. Four grains of potassium mercuric iodide dissolved in four ounces of water before mixing makes a proportion, in the lubricant soap, of 1:2000. In ordinary cases, without ammoniacal urine, the administration of urotropine is enough. It is useful in all bladder, urethra, and kidney cases that require surgical treatment to administer urotropine internally for a few days before operation—that is, of course, if the condition does not urgently demand operative procedures.”

External Urethrotomy.—HARRISON (*Lancet*, March 17, 1900) says that this operation seems especially applicable to the following cases: 1. To resilient and rapidly contractile strictures in the deep urethra, which, like burn scars, are unamenable to stretching and dilatation, and where a splice or an interval of new tissue is required within the circumference of the contraction.

2. In cases where the wound made by an internal urethrotomy is out of proportion to the drainage possibilities of the urethra. A wound may be so constructed within this canal as never to drain completely, either in regard to urine or to its own discharges. The result is much the same in these cases as that which follows accidental lacerations of the urethra. Some years ago the author demonstrated in a considerable number of cases that partial ruptures of the urethra from violence, when treated properly by perineal section and drainage, were no more liable to be followed by traumatic strictures than either a median or lateral cystotomy for stone. This was suspected because it was noticed that the slighter cases of ruptured urethra, either not treated or treated by the retention catheter, were those which were followed by the most dense and contractile forms of traumatic stricture; whereas the severe cases, where the rupture was so extensive and so complete as to render the introduction of the latter instrument impossible and to necessitate a perineal section with bladder drainage, did the best, and were much less liable to the subsequent formation of a stricture at the site of the wound. Surgical cleanliness and drainage were evidently important items in the prevention of the latter. In dealing with any lesion of the urethra,

made either accidentally or surgically, we must feel fairly sure that the unaided efforts of the wounded canal are sufficient to furnish adequate drainage, otherwise this should be artificially supplied. It is reasonable to infer from these observations that in the large proportion of cases where internal urethrotomy gives excellent results the operation precisely fulfils the required condition—namely, the complete division of the stricture by a wound which the urethra itself is capable of draining. It is no doubt possible in some instances where considerable wounds are made within the urethra to supply the drainage by the retention of a catheter for some days after the operation. This expedient often fails, as in the case of accidental injuries, and is not so reliable or cleanly as the external incision and the drainage-tube.

3. In cases of stricture complicated by urinary fistula and sinuses. The division of the stricture from without and the formation of a single opening for urine drainage communicating directly with the bladder often lead to a speedy recovery in these instances.

4. In cases of stricture with extravasation of urine. The division of the former, with direct drainage of the urine from the bladder as well as from the surrounding tissue, is a matter for separate consideration.

5. In some rare cases of wounds connected with the treatment of stricture which are rapidly followed by acute symptoms of impending death, the rapid draining of the bladder prevents further absorption of toxins and saves the patient.

The points to which he attaches importance in operating are: (1) The use of a guide. (2) The utility of an internal urethrotomy as an immediate preliminary to the external operation is shown by the ease and completeness with which the latter can be carried out on a larger staff than could be otherwise used. (3) The necessity of cleanly and efficient urine and wound drainage. The entire character of the tissue by which the stricture is repaired after it has been divided either by external or internal urethrotomy may be determined by the nature and duration of the drainage and irrigation that is employed.

The Relationship between Cholecystitis, Jaundice, and Gallstones — MACLABEN (*Annals of Surgery*, April, 1900) points to the fact that jaundice is not always a symptom of cholelithiasis. There can be no question that jaundice is a very much overrated symptom, nor that many patients pass through an attack of cholecystitis and later carry stones for years without any discoloration of either eyes or skin. Within a year the author has operated upon nine cases of gallstones, and in not one of these cases has there ever been any jaundice at all. The reason for this may be the fact that none of them has passed gallstones. He is inclined to believe that the passage of gallstones is rather an unusual occurrence; that when we speak of a patient as having biliary colic we are apt to believe that the colic is due to the passage of gallstones. The few cases cited would prove that this is not the fact, because in almost all of them, either through stricture or through wedging a stone in the cystic duct, the gall-bladder was shut off from the other biliary tracts. Still, all of these patients had suffered intense colic, and nearly all of them before operation had at different times to be relieved by morphine in large doses. All of these cases gave symptoms which are

usually ascribed to the passage of gallstones; in most of them the feces were washed and strained through a sieve without finding a single stone, and, further, the conditions found at the operation were such as to preclude the passage of a stone.

In all but one case the gall-bladder was found inflamed, thickened, and frequently adherent to the neighboring organs, in one case producing a mechanical dilatation of the stomach, through the influence of adhesions which existed between the gall-bladder and the pylorus, the conditions found to be present showing that the pain from which the patient had suffered was due to the cholecystitis, and not due to the passage of gallstones. Most of the chronically jaundiced cases have been found by the author to be malignant disease of the liver. The most pronounced jaundice seen was due to septic infection, and there was no biliary involvement. The impaction of stones in the common duct he has found to be of rare occurrence; they are much more frequent in the cystic duct, and can be generally removed with ease through the gall-bladder. In one case a faceted stone was discovered that had ulcerated its way out of the gall-bladder, and was found encysted in the under surface of the liver.

He thinks that inflammation of the gall-bladder is the first step in the majority of cases in the formation of gallstones, and that the gallstones are a secondary product of this inflammatory condition, being, therefore, a symptom rather than a disease.

There is apparently good evidence to show that gallstones are the result of bacterial infection. The bacteria enter the gall-bladder through the liver, which filters them out of the circulation; agglutinating in masses together with epithelial cells they provide the nuclei about which calculi form.

The Closure of Abdominal Wounds and Hernial Openings with Silver Wire.—WITZEL (*Centralblatt für Chirurgie*, March 10, 1900) calls attention to the value of silver wire in securing absolute closure of abdominal wounds and a guarantee against the occurrence or recurrence of herniæ.

Absolute asepsis is essential to the primary union of such wounds and the healing in of deep or permanent sutures. The suture which takes in the whole abdominal wall has been found to be unsatisfactory, and the best results are obtained by careful suturing of each separate layer by itself. It is particularly essential that the fibrous commissure of the rectus sheaths should be brought into exact coaptation. The formation of herniæ through scar-tissue is the result of the stretching and weakening of the scar by muscular action.

In employing silver wire in the closure of abdominal wounds he advises the suturing of the separate layers with silver wire and the placing of the stitches in such a manner that the sutures cross and recross each other over the wound, forming a sort of network, which strengthens the scar and prevents the stretching and separation of the muscular layers.

The network of wire which is placed over the hernial orifice should be at least three times as wide as the original opening. The interweaving or "darning" of the silver wire is very effectual in forming a plug in the closure of all herniæ.

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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Typhoid Fever in an Infant of Nine Months.—W. P. NORTHRUP (*The Medical Age*, May 10, 1900, p. 331) reports a case which he states is the youngest undoubted case of typhoid fever in his experience. At the time of admission to the hospital under Dr. Northrup's care the father and two brothers of the baby were also patients in the hospital suffering from the same disease. The mother was not infected, and nursed the baby at her breast. The infant had been crawling about the bed of its father, sick in his second week, and of a brother, sick seven weeks, the latter the first of the family to be affected. Twelve days before admission a physician took the baby's temperature and told the mother that the baby had the "same sickness" as the father and brothers. For a week before this the passages were frequent and greenish. The temperature was 103° upon admission, the tongue coated, abdomen hard, distended, and tympanitic, the spleen distinctly palpable one and a half inch below the border of the ribs, the liver also enlarged slightly. Rose spots appeared six days after admission to the hospital. The passages continued frequent, soft, and containing mucus and greenish pultaceous masses for about ten days. By the nineteenth day of the disease the temperature began to fall, and the spleen was markedly reduced in size. From the time the family physician first took the temperature to the end of the fever in the hospital was twenty-four days.

The Widal test confirmed the diagnosis only after the temperature had returned to normal.

The feeding of this case is rather interesting. The mother came three times a day to the hospital and nursed the baby. Other feedings consisted of milk diluted with water and lime-water. This mixture seemed to disagree, as indicated by the passages. Modified milk was therefore substituted. The first prescription was: Fat, 2 per cent.; sugar, 5 per cent.; proteids, 0.75 per cent.; ten feedings of two ounces each, of 10 per cent. alkalinity, and Pasteurized at 155° for twenty minutes. This was fairly borne, and the proportions were increased to fat, 3 per cent.; sugar, 6 per cent., and proteids, 1 per cent., which was found to produce flatulence, with mucus and curds in the stools. The prescription was reduced to the former percentages for a few days, when the symptoms were relieved, and the prescription was again changed to the stronger combination. From this point the ingredients of the mixture were gradually increased to a 4-7-2 mixture.

[This case illustrates the point which Dr. Northrup has long maintained, that typhoid fever is a disease to which there is little susceptibility in

children under two years of age, except in the presence of an overwhelming poison (multiplied exposures), as was undoubtedly the condition in the case here recorded. It is only the sixth case which Dr. Northrup has observed in patients under two years of age.—ED.]

The Spleen in Rhachitis.—SASUCHIN (*Jahrbuch. f. Kinderheilkunde*, 1900, Band i. (n. s.), S. 297) bases this study upon an examination of the spleen in sixty-six cases of rhachitis in which death had been the result of the cachexia or of an intercurrent malady, most frequently a gastro-enteritis or bronchopneumonia.

Almost always the organ was hypertrophied, the exception being in cases in which athrepsia was advanced, and here the spleen in weight and size was close to the normal or even sometimes manifestly atrophied.

The histological lesions were those of interstitial splenitis. The proliferation of connective tissue ordinarily follows the vessels, whose walls are thickened and whose lumen is reduced. Inflammatory phenomena are shown by the appearance of irregular epithelioid cells with cloudy protoplasm and nuclei staining poorly.

This interstitial splenitis, according to the author, is produced by rhachitis, and cannot be attributed to the later complication, since it is observed in the most varied conditions, while it is entirely absent in non-rhachitic infants that have succumbed to the same complications.

The Palatine Tonsil as a Port of Entry for Tuberculous Infection in Young Children.—Believing that the tonsils are the primary seat of many infectious conditions, FRIEDMANN (*Deutsche medicinische Wochenschrift*, June 14, 1900) has made a study to determine whether the tonsil in childhood may not constitute a frequent port of entry for tuberculosis. The study embraced ninety-one post-mortem cases and fifty-four living subjects. He recognized that tuberculosis of the tonsil may exist either as a primary infection from food or as a secondary infection from sputum containing the bacilli. Contrary to Koch's opinion discrediting the influence of the milk or flesh of tuberculous animals in communicating the disease to man, the author is led to attach considerable importance to this possible method of infection, the more so as secondary infection of the tonsil from the sputum is a comparatively rare condition in childhood.

A Case of Recovery from Tuberculous Cerebro-spinal Meningitis—M. HENKEL (*München. medicinische Wochenschrift*, June 5, 1900) records a case of proven tuberculous cerebro-spinal meningitis in which recovery ensued. Tubercle bacilli were found in the cerebro-spinal fluid. The case ran a long and tedious course, but finally recovery ensued. Internally calomel was the only remedy given, with the addition of a daily bath for ten minutes at a temperature of 95° F., gradually reduced to 85°.

The Prevalence of Rickets in Russia.—STJELBITSKY (*Dietskaya meditsina*, February, 1900) presents a statistical study of the prevalence of rickets in the Tula district, which shows that in this section of Russia, at least, rhachitis is extremely common. Two thousand children were examined, 1000 of

whom were seen in dispensary, 874 among the peasantry, and 126 in private practice. Among the peasant class 77.5 per cent. were affected; among the dispensary cases, as might be expected, a somewhat higher proportion was found—83.8 per cent., while 60.3 per cent. were affected among the children seen in private practice. The age varied from three months to two years.

Bad hygiene of the surroundings did not seem to influence the occurrence of the disease to any appreciable degree; nor could the author show that there was any close connection between rickets and syphilis. Gastro-intestinal derangements seemed to play the most important rôle.

THERAPEUTICS.

UNDER THE CHARGE OF

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Olut Kombool in Dysmenorrhœa.—DR. B. M. SIRCAR recommends the fresh, viscid sap from the *Abroma Augustum*, of the natural order *Bythneraceae*, which is a large, spreading shrub found in the non-tropical parts of India. The medicine [amount not stated] is used for two days before, during the flow, and for two days after the cessation of the menses. A single administration during the menses generally cures the disease and brings on conception in young married women. The remedy is efficacious in both the congestive and neuralgic forms of dysmenorrhœa, but it has no action upon the mechanical variety nor on organic lesions of the uterus. Forty years' experience with the remedy is the basis of the author's confidence.—*Indian Medical Gazette*, 1900, No. 5, p. 172.

The Physiological Properties of the Nitrites—M. EDMOND FIQUET has been impressed with the fact that the group CO_2H , when substituted for H in an organic molecule, has the property of diminishing the toxicity of the primitive body. It has been demonstrated that hydration and oxidation which take place in a living molecule give rise to products of disassimilation, named leucomaines, and as when, in consequence of a partial arrest of hydration and oxidation, these are poorer in oxygen, they become more toxic and resemble ptomaines. If we introduce a carboxyl group the molecule becomes more oxygenated, and consequently less toxic. By the action of sodium cyanacetate or cyanacetic acid on benzylic aldehyde and oxybenzylic aldehyde various nitrites are formed. Acetic nitrite, however, is obtained from the distillation of cyanacetic acid. Acetonitrite, cyanacetic acid, cinnamic nitrite, and α -cyanacinnamic acid have been employed. These experiments resulted as follows: (1) Acetonitrite is much less toxic than is generally supposed; but in general the higher nitrites are very toxic, acting upon the organism as do ptomaines. They dilate the pupil, which, however, con-

tracts at death; they destroy sensibility and muscular contraction and produce marked paralyses, slowed and irregular respiration, and convulsions. These characters approach closely those produced by injection of human urine into rabbits, particularly if from patients suffering from certain neuroses. The suggestion is made that very toxic urines may contain a body possessing a nitrite function. (2) The influence of the CO_2H group considerably diminishes the toxic power of the nitrites without always destroying the inherent properties of the CH —that is to say, during the administration of these derivatives the symptoms of the cyanic group appear. The CO_2H group is not the only one which produces modifications; the SO_3H group behaves in an analogous manner.—*Les Nouveaux Remèdes*, 1900, No. 9, p. 193.

Epicarin in Dermatology.—DR. CARL G. PFEIFFENBERGER has made use of this substance in pediatric practice, especially for scabies and prurigo. Noting the irritation produced by naphthol, the dangers of nicotine, and the unpleasant effects of styrax, he congratulates himself on the absence of untoward symptoms from fifty instances of the use of this substance. This occurs as a reddish powder of sour odor, and is a condensation product of cresotinic acid and naphthol. It is acid, and dissolves readily in alcohol, ether, and vaseline; in the latter a 7 per cent. solution is employed. Inunction is practised once daily (in the evening) and the following day a warm bath is given. Finally the cure is completed by diachylon or zinc ointment. The following is presented as an eligible form of administration: Epicarin, 7; chalk, 2; white vaseline, 30; lanolin, 15; lard, 45.—*Klinische-therapeutische Wochenschrift*, 1900, No. 19, S. 586.

Treatment of Typhoid Fever.—DR. FRANK BILLINGS believes better results are obtained from hygienic than from drug treatment. General management: Select a room free from hangings and upholstery, preferably carpetless, sunny, near a water-closet which may be wholly under the nurse's control. Thorough cleanliness is essential. Soiled garments and bedlinen are best disinfected by immersion in corrosive sublimate (1:1000); the same solution may be used on the patient's skin. Feces and urine contain the bacilli and are the usual media of contamination of soil and drinking-water. Both should be thoroughly disinfected. An efficient nurse can prevent dry, cracked lips, dirty tongue, sordes, and bed-sores. Milk is the best diet. It may be modified by dilution with lime-water, Vichy, or other mineral waters, or it may be boiled or peptonized. Buttermilk, koumyss, and matzoon are useful. Occasionally patients cannot digest milk; substitute thoroughly cooked gruels, made from any of the cereals, mix well with milk or animal broths, or plain water. Animal broths are of more value as stimulants than as nourishment. They must not be used alone as foods, nor if there be diarrhoea. In patients who are not seriously ill, in whom the usual nervous phenomena are absent, possessing good appetite and good digestion, ordinary mixed diet of liquids and solids is often well borne. Others, profoundly ill, exhibiting the typhoid state, badly poisoned, suffering from nausea, vomiting, poor digestion, constipation, or diarrhoea, require scrupulous care in selection of diet, and for these milk constitutes the ideal food. There are all grades between these extremes, and diet must be chosen accord-

ingly; there can be no fixed rule. Drug treatment will not lessen mortality. Symptomatic treatment of emergencies is advised. A good cathartic at the commencement of treatment is useful. The choice of the cathartic is immaterial. The so-called Brand bath is highly praised. The urine has double the toxicity of normal urine, and under hydrotherapy this is increased five times; the symptoms diminish in direct ratio as urinary toxicity increases. Cold bathing improves blood-pressure, deepens respirations, and the urine increases in amount. The first baths should be given when the temperature reaches 102.2° F. Temperature of bath, 68° F.; duration, fifteen minutes; ample friction should be used. To be repeated every three hours, when temperature is again 102.2° F. Modifications of the Brand bath are followed by less marked improvement. Coal-tar derivatives are condemned as a whole. Antipyrine does not cause improvement through elimination of toxins, for urinary toxicity is diminished by its use. These same toxins continue to be excreted for a month after convalescence begins, when antipyrine has been used. Antipyrine and others of the same group are harmful because they do not prevent the formation of toxins; they diminish their excretion. They palliate by reducing temperature. When the bath is used the toxins are all eliminated by the beginning of convalescence. Delirium, heart weakness, and bronchitis may be treated by drugs. Hydrotherapy improves these, however, without recourse to drugs, "and one does not need, therefore, to consider the drug treatment" (?). The writer proceeds, however, to recommend opium or bismuth in diarrhoea. Constipation requires enemata and laxatives. Chloral and sodium bromide will control delirium when baths cannot be given. Hemorrhage requires morphine hypodermatically and introduction of saline solution with 0.2 per cent. of calcium chloride.—*International Medical Magazine*, 1900, No. 4, p. 247.

Variety in the Diet of Typhoid Fever.—DR. A. H. SMITH doubts the wisdom of too close an adherence to a milk diet. There is no reason why part of the required food elements should not be taken in one kind of food and part in another. In milk there is albumin, fat, and sugar. The proportions present are not equally suitable in all cases. When the tissues present an excess of fat, less fat and sugar are indicated. If casein is difficult of digestion some other nitrogenous food should be substituted.

Diet and temperature: In addition to the specific infection, there are absorption of poisonous food products through the unbroken mucous membrane, and septic infection from open ulcers. Enteric fever renders normal digestion very unfavorable; opportunity for chemical change and the formation of abnormal products is excellent. Fever interferes with glandular action, favors fermentation and absorption of ptomaines. Fluctuations in temperature above the morning remission and afternoon exacerbation are due to absorption. Therefore, diet should be such as is least likely to undergo fermentative changes. Milk, if not perfectly digested, furnishes irritating and poisonous substances. Undigested casein may form very firm granules, producing local irritation more marked than so-called solid food, the latter tend to disintegrate on their intestinal journey. Milk-curds grow more compact, forming, finally, masses of chalk-like consistency. Milk may cause flatulence, which is especially to be avoided during ulceration. A

variety of fluid and semi-fluid food may be given, even in the early stages, with decided benefit. More food than generally given is not needed, but a greater variety. For the first ten or twenty days food should be given sparingly, lest a residue, decomposing, may increase the fever. Patients are better nourished by a variety of food in small quantities than by larger amounts of a single article. The rule is to give the minimum of food that will sustain the patient. Temperature may fall as a result of diminishing the food in the early stage, when vitality is still unimpaired, and later a like result follows a more liberal diet in a less diluted form. Temperature within one degree of normal often continues until a more nutritious, semi-solid diet is given. Following are recommended articles of diet: milk, broths, soft-boiled eggs, junket, custard, soft part of raw oysters, sago, tapioca, corn-starch, animal jellies. Any rise of temperature above the usual range should cause careful scrutiny of diet among other possible factors. Mental condition excluded, increased fever, if there be abdominal fulness, is probably due to undigested food. If distention be absent, fecal absorption is occurring. If repeated, and sweating be also present, septic absorption from ulcers is the probable cause. If milk disagrees markedly the percentage of casein can be diminished by allowing the milk to stand in a cool place for five hours. Pour off the upper half for use, and restore the original bulk by water. Specks of undigested curds in movements require this procedure. Acid eructations showing the presence of too much fat demand the use of partially skimmed milk. Coffee may be added to the milk to relieve monotony; in addition it acts as a cardiac stimulant.—*International Medical Magazine*, 1900, No. 4, p. 244.

The Treatment of Pneumonia.—DR. NATHAN RAW remarks that patients are more often damaged than helped by the promiscuous drugging which they receive in this disease. At the outset three to five grains of calomel, followed by a saline every three or four hours, with which two grains of quinine are included, is beneficial. The ice-bag, or even a mustard and flax-seed poultice, may be indicated for pain. To digitalis much has been attributed, but on the whole it has not been a success. If the heart's action becomes very rapid, with a quick and irregular soft pulse, it sometimes does good when given in large doses, say fifteen or twenty minims of the tincture every two hours until two drachms are taken, or digitalin hypodermatically, one-thirtieth to one-twentieth of a grain, has a marked temporary effect in tiding over the patient during a critical period. Ten grains of chloral with four drachms of the infusion every four hours gives the patient much relief from delirium and sleeplessness. Objection is made to antipyretics, although sponging the surface with ice-water is recommended. Ammonium carbonate acts as a stimulant and expectorant, but readily disturbs digestion, and must then be discontinued. In progressive cardiac failure brandy in from six to twelve ounces every twenty-four hours is indicated. In many instances alcohol in any form is not required. Strychnine is a most valuable cardiac tonic, and given hypodermatically in doses of one-twentieth or even one-twelfth of a grain will sometimes have a miraculous effect upon the heart. His experience with oxygen has not been, on the whole, good. The prophecy is made that the treatment of the future will be

the antitoxic treatment, used early, so as to abort the disease by destroying its toxins.—*Medical Press and Circular*, 1900, No. 3181, p. 417.

DR. J. C. WALTON relies more on Norwood's tincture of *veratrum viride*, two to four minims every two hours or oftener, watching its effect on the pulse, gradually bringing it down to 70 or 80 and holding it there until the disease is under control. In combination with ice it more nearly approaches a specific than any other treatment. Ice-bags constantly applied over the inflamed lung and over the heart, not only for their effect in reducing the temperature and in bringing down the pulse and respirations, but for their constringent effects on the capillaries, add much to the comfort of the patient and frequently abort the disease. If the treatment should fail to arrest the disease the subsequent stage is milder and more easily managed. If it goes into the second stage give ammonium carbonate, five grains every two hours, not only for its stimulating effect, but because it is the best absorbent which we have. By thinning and dissolving the tenacious secretion the patient is enabled to expectorate without difficulty, adding, when necessary, especially if the first sound of the heart is weak, alcohol. Strychnine is the best stimulant, and should be used freely when indicated. Digitalis is of great service when the pulse is weak and rapid. Transfusion of normal salt solution should be employed in extreme cases.—*Virginia Medical Semi-Monthly*, 1900, No. 3, p. 77.

Laryngeal Tuberculosis.—DOTT. A. FASANO proposes the following by insufflation: Thiocol, 1; cocaine, 2; boric acid, 10. If the tuberculosis is primary the results are excellent.

DOTT. S. LODA recommends menthol, iodoform dissolved in ether, and cocaine, with which he obtains immediate relief from dysphonia.—*Gazzetta degli Ospedale e delle Cliniche*, 1900, No. 60, pp. 633, 634.

Apocynum.—DR. T. B. MCGEE, mentioning the aids to digitalis in chronic cardiac disease, calls attention to this indigenous plant, stating that it is excellent in cardiac dropsy if a good preparation is employed. Large doses are apt to disagree, and small ones are preferable for diuretic action. One of its active principles—apocynin—appears to resemble digitalin in its effect upon the heart, so that the diuresis produced is evidently cardio-vascular in character, and it practically represents the diuretic principle of the drug. Apocynum causes no cumulative effects, and it will occasionally prove efficient in removing dropsical symptoms of cardiac insufficiency.—*American Therapist*, 1900, No. 10, p. 193.

An Iodized Serum.—DOTT. A. SCLAVO notes the great importance of iodine, especially in the various manifestations of syphilis and of tuberculosis. Beside the preparations of iodine employed by various authors, he cites those produced by the combination of iodine and several proteid substances—*e. g.*, the action of Lugol's solution on egg-albumin, milk, peptone, and gelatin. By the action of iodine on blood-serum prepared aseptically he has produced an albumin-iodine preparation which may be administered hypodermatically or endovenously. Given in this form it is eliminated more slowly than when potassium iodide only is employed. In doses of from

two to four drachms or more, given subcutaneously, it is rapidly absorbed, without local or general disturbance. To the present time this has been experimented with in tuberculosis and syphilis with good results.—*Rivista Critica di Clinica Medica*, 1900, No. 14, p. 274.

GYNECOLOGY.

UNDER THE CHARGE OF

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Condition of the Uterus after Extirpation and Transplantation of the Ovaries.—RUBENSTEIN (*St. Petersburger med. Wochenschrift*, 1899, No. 31), as the result of experiments on rabbits, arrives at the conclusion that when the ovaries are transplanted and preserve their functions the uterus shows no evidences of atrophy, but when, on the contrary, they become atrophied the uterus undergoes the same changes as after castration—i. e., atrophy of the muscle and endometrium, thickening of the vessels, and general hypertrophy of the connective tissue.

This disposes of Sokolow's nerve theory, since after transplantation of the ovaries to a distant locality (in one instance to the mesentery near the spleen) there could have been no re-establishment of the nerve-anastomoses between these organs and the uterus. In order that the latter should not undergo atrophy it is only necessary that the ovaries should still remain within the body and should preserve their integrity.

In the writer's opinion the only satisfactory explanation is that based upon the theory of the internal secretion or trophic influence of the ovaries, which, although not absolutely established, is supported by so many clinical and experimental observations that it may be regarded as highly probable.

Exploration of the Abdomen as an Adjunct to Every Coeliotomy.—KELLY (*Medical News*, December 16, 1899) calls attention to the importance of making a routine examination of the entire abdomen whenever the cavity is opened, since in this way unsuspected morbid conditions may be discovered when the attention is not directed entirely to the pelvic organs. Not only secondary deposits in cases of malignant or tubercular disease of the pelvis, but mechanical obstruction of the vascular, urinary, or alimentary channels may be detected. If this examination is negative both the operator and the patient have the satisfaction of knowing that no visceral lesion is present to retard convalescence or to menace life subsequently.

In conducting such an exploration strict asepsis should be maintained, preferably the use of rubber gloves with sleeves reaching to the elbows. A regular system is observed in palpating the different organs from the pelvis to the diaphragm.

There are three classes of cases in which this exploration is indicated—

viz. : 1. Those in which there is no reason to suspect disease of the abdominal viscera, and the examination is made simply as a routine procedure, which does not add to the gravity of the operation. 2. Those in which, contrary to expectation, no evidence of disease is found in the immediate vicinity of the pelvis. 3. Cases in which the nature of the pelvic lesions renders it probable that some of the neighboring or remote organs will be affected.

Abdominal Hysterectomy in Cancer of the Uterus.—MAUCLAIRE (*La Presse Médicale*, 1899, No. 76) discusses the question as to whether the abdominal method of extirpating the cancerous uterus insures a radical cure. He assumes that it should not be attempted except in the early stage of cancer of the cervix, or in cases of slowly-growing cancer of the corpus uteri. The French statistics of mortality are still high, being at the best 22 per cent.—three times as large as by the vaginal method. Moreover, many operations are incomplete, since the pelvic lymph-nodes are not removed.

It has been affirmed that there is less probability of recurrence after abdominal extirpation, and this would doubtless be true if the operation was performed at a sufficiently early stage, which is seldom the case. Sufficient evidence has not yet been obtained to justify positive conclusions.

Primordial Ova and Follicles in Senile Ovaries.—AMANN (*Ibid.*) describes the histological appearances in ovaries removed from a woman, aged sixty-three years. They contained cavities lined with cylindrical epithelium, many of the cells having large nuclei; these cavities were surrounded by spindle-cells which stained deeply. Smaller cell processes were seen near the periphery of the ovary with cystic dilatation. The cells corresponded perfectly to those of the primordial ova in the foetal ovary, while the spindle-cells were identical morphologically with the epithelium of the primitive follicles.

The epithelial cysts and pouches doubtless originate from the germinal epithelium, as all the transitional forms are seen in serial sections. Cells like those of the primordial ova have been described in papillary and carcinomatous ovarian cystomata, but the writer believes that the case reported is the first in which the early development of adenocystoma from the germinal epithelium has been actually demonstrated, since primary follicles as well as primordial ova were present. It seems to prove beyond question that ovarian cysts develop from the germinal and not from the follicular epithelium.

It is surprising that the germinal epithelium in a senile ovary should preserve its activity and show the proliferative changes peculiar to foetal life.

Treatment of Inoperable Carcinoma.—HERFF (*Ibid.*) regards chloride of zinc as the best escharotic, although it must be used with care. Tincture of iodine is applied after removal of the slough. Tampons covered with iodoform or nosophen should be applied several times daily. As a hæmodynamic the writer prefers tampons saturated with a 5 per cent. solution of gelatin to chloride of iron. Calcium carbide is the best application to check

both bleeding and a foul discharge. The surface is disinfected thoroughly, dried, and a piece of the carbide is placed in contact with it and left *in situ* for two or three days. Healthy granulations are thrown out, the hemorrhage is checked, and in many cases the pain is sensibly diminished.

Conservative Treatment of Pelvic Peritonitis.—STRATZ (*Ibid.*) is strongly in favor of the non-surgical treatment of pelvic inflammation by means of hot douches and ichthyol. He prefers conservative vaginal section to laparotomy, having performed the latter only twenty times in over 1000 cases with one death. His objection to the removal of diseased adnexa is based upon the unsatisfactory ultimate results which follow even the most thorough operations.

OBSTETRICS.

UNDER THE CHARGE OF

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Complete Rupture of the Uterus and Extirpation; Recovery.—In the *Centralblatt für Gynäkologie*, 1900, No. 19, WALLA reports the case of a multipara in labor with transverse position of the foetus. The physician summoned to the case performed version and readily extracted the child and placenta. The vagina was tamponed with iodoform gauze. When the patient was admitted to the hospital and examined a complete laceration of the uterus was found, extending across the anterior wall down to the connective tissue behind the bladder. The patient was in good general condition, having a pulse of 108 and a temperature of 99.5° F.

Operation was decided upon for the following reasons: The patient was in good condition, although the laceration was extensive. The slight rise of temperature which was present gave an indication that septic infection very possibly had begun. The patient had been delivered in a tenement-house and had been examined by a midwife. It was scarcely possible that under these circumstances she was in a perfectly aseptic condition.

The uterus was extirpated by abdominal section and extensive laceration of this organ found, extending into the parametrium of the right side. The patient reacted fairly well from the operation. During sixteen days afterward she suffered from fever, and an infected blood-clot was removed through the vagina from the right side of the pelvis. Formation of pus followed, which gradually ceased under the use of cleansing douches. The patient ultimately made a good recovery.

In the same clinic at Buda Pesth previous experience with these cases had been as follows: There had been in the clinic 28 cases of rupture of the

uterus, of which 17 had been incomplete and 11 complete. Of the 17 all were treated without operation, but by the use of gauze drainage introduced through the vagina. Seven of these patients recovered; 10 died. In the 11 cases of complete rupture 6 were treated without operation, and all of them died. Of the 5 remaining 3 died and 2 recovered after operation. The causes of death in the cases operated upon were sepsis in one case, acute anæmia following hemorrhage in another, and in the third hemorrhage following the slipping of a ligature upon the left spermatic artery.

The Care of New-born Children.—In the *Archiv für Kinderheilkunde*, 1900, Band xviii., Heft 5 and 6, BEREND draws attention to certain points in the management of new-born children, and quotes extensively from several authors. He draws especial attention to the great necessity for the strictest cleanliness in all hospitals where new-born children are kept. As regards the care of the umbilicus, he believes that the stump of cord should be thoroughly compressed to squeeze out blood and fluid before the cord is permanently tied. The child should be bathed and put to rest as soon as possible after this, to avoid being chilled. After the bath the stump of cord should be cleaned with sublimate solution and alcohol, and should be enveloped in cotton or gauze, turned toward the left side of the child, and kept in position by a binder. The cotton or gauze which surrounds the cord should not be removed until the stump separates. The external bandage may be replaced as often as necessary. When this is done the umbilical ring should be washed with sublimate solution. The primary dressing of the cord should be disturbed only when fever occurs. The child should not be given a full bath until the cord has separated and the umbilicus is well healed.

Berend believes that washing out of the mouth of the new-born child should seldom be done through danger of contamination. He believes that much mischief occurs through improper treatment of the nipples. These should not be washed in strong antiseptic solutions, but should be cleansed only in the gentlest and least irritating manner.

The Diagnosis of Congenital Disease of the Heart.—GRIFFITH, in the *Philadelphia Medical Journal*, September 30, 1899, gives the following points as diagnostic of congenital heart disease: The history of cyanosis from birth is especially important. Next is the presence of a loud, harsh murmur, heard most distinctly in regions where the ordinary murmurs of heart disease are not heard. Third, the absence of enlargement of the heart.

Appendicitis Complicating Pregnancy.—In the *Annales de Gynecologie et d'Obstetrique*, 1900, p. 357, PINARD describes several cases to which he had been called in consultation where pregnant women had been seized with pain which was mistaken for the beginning of labor. When the cases were carefully scrutinized, constipation, fever, pain in the right side, and a history of indigestion were present. The cases were appendicitis, and the patients rapidly became seriously ill. In one case occlusion of the intestine was present, and upon operation appendicitis and subsequent peritonitis were found to be the cause of the occlusion of the bowel. These patients in

most instances aborted after the operation. Bacteriological examination showed the bacillus coli communis to be the germ most frequently present. All patients under his observation recovered after being treated promptly by operation.

Delivery by Basilysis.—In spite of the increasing success with Cæsarean section, perforation of the living child is still practised in some cases. In the *Scottish Medical and Surgical Journal*, 1900, p. 403, SIMPSON describes the case of a girl, aged eighteen years, a dwarf, admitted to the Edinburgh Maternity Hospital in the ninth month of pregnancy. The child was living and in good condition. The pelvis was universally and unequally contracted and too small to permit the birth of a viable child. The patient came into labor, and craniotomy was determined upon because the mother was "a pallid, delicate creature, who appeared a bad subject for the graver forms of interference." Simpson's basilyst was introduced, an opening made in the vault which allowed the complete breaking up of the brain and cerebellum, which were washed out with a lysol douche. The instrument was screwed into the anterior part of the head and the blades separated in different directions. The head then descended and was readily delivered without lacerating the mother. An uninterrupted recovery followed.

Simpson's basilyst combines a central perforating stem and blades, which can be used as a cephalotribe and also as tractors. That it is an efficient instrument is evident.

[The choice of operation in this case cannot be admitted without comment. Had this patient been infected by efforts at delivery before she came into the hospital, or had she been exhausted in labor, as she was a frail person, the choice of the method of delivery would have seemed to us a clearer one. But, in our experience, it is possible to deliver frail young women who have not been infected and exhausted, by Cæsarean section, with the recovery of the mother, who nurses her living child. We are aware that it is easy to criticise a case which we have not personally seen. It is, however, fair to compare experiences.—ED.]

A Problem in Antenatal Pathology.—Under this title BALLANTYNE writes in the *American Journal of Obstetrics*, 1900, p. 577, of healthy parents who had two normal children born by normal labor. Then came an abortion at the second or third month; following this ensued five pregnancies, after one of which a normal female infant was born and survived. The other four pregnancies terminated in the birth of female infants, stillborn or perishing soon after birth with hydrocephaly, anencephaly, spina bifida, general debility, malformed hands, malformed feet, and absence of the radius. In these cases there were prolonged gestation, abnormally shortened gestation, amniotic bands, and abnormalities of the placenta.

In the mother's history there was found a tendency, hereditary on her part, to malformation of the thumb, and this peculiarity was reproduced in her later pregnancies. No other cause could be assigned for these abnormalities. As regards treatment, it is suggested that the uterus be curetted and that thyroid extract be administered during the early stages of the next pregnancy.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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AND

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Sudden Changes of Refraction in Diabetes.—G. SOURDILLE (Nantes) reports the case of a man, aged fifty-three, who had not used glasses until fifty-one, who was passing 187 grammes of sugar in the twenty-four hours. He came complaining of the sudden impairment of sight, which in four days had fallen from normal to one-sixth. Convex lenses of 2 D. restored full vision, and 3 D. added to these enabled him to read the finest print. The ophthalmoscopic appearances were normal, but the tension of the eyeball was slightly diminished. Eighteen days later, the sugar having disappeared from the urine, the patient complained he could no longer see with his glasses. He had full vision without them, and could read the finest print with + 2 D. His hyperopia had entirely disappeared, and the tension of the eyeball was normal.—*La Clinique Ophthalmologique*, May 25, 1900.

[Similar cases have been reported by Horner, Risley, and Doyne. The most probable explanation for them, offered by Horner, and which Sourdille is disposed to accept, is that the removal of water from the vitreous humor by the sugar-laden fluids of the body causes an actual shrinkage of the eyeball and consequent axial hyperopia.—ED.]

Operations for Entropion and Trachiasis.—H. HERBERT (Bombay) reports upon a large experience with these operations in India.

Generally speaking, of late, division of the tarsus from the conjunctival surface has been practised where tarsal deformity was slight or absent, and removal of a horizontal wedge of tissue from the anterior surface was reserved for the more definitely deformed tarsi.

In division of the tarsus the lid-margin was bent forward over a small roll of plaster by sutures firmly embedded in the tarsal margin below and in the skin above; or a more decided bending forward was effected over a pad of wet lint by sutures passing from lid-margin to eyebrow.

In the removal of a horizontal wedge of tarsus and overlying muscle through a skin incision and the application of specially devised sutures, the position of the wedge is important. It should be as near the free margin as possible, *i. e.*, immediately above the roots of the eyelashes. Thus there is a narrow strip of tarsus left below and a comparatively broad plate above, so that, when the anterior surfaces of the two are drawn together, any displacement which may occur will be in the more readily moved and more readily

moulded to the narrow marginal strip. The depth of the wedge should be in all cases sufficient completely to divide the tarsus. The breadth of the wedge at its base depends largely on the degree of entropion existing. Not only muscle, but a narrow strip of skin should be cut away in most cases, otherwise it is redundant afterward.

Three simple sutures properly inserted are much more effective than Snellen's sutures. The curved needle is to be introduced a little behind the most posterior lashes, and passed obliquely forward and upward, to be brought out immediately above the lower margin of the skin-wound. Thus the more the trachiasis or distichiasis the further back will the point of entry be, and when the sutures are pulled upon the more will the border of the lid be brought forward. The needle should then be passed into the anterior surface of the upper piece of tarsus well above the cut edge, and brought out again after taking a firm hold; neither skin nor muscle is taken up.—*Ophthalmic Review*, July, 1900.

Treatment of Simple Chronic Glaucoma.—M. ROGMAN (Gand) reports five cases operated on by iridectomy, and subsequently observed for periods varying from six to twelve years. In two of these one eye was submitted to iridectomy, and the continued use of a myotic was tried in the other. In all cases the experience was favorable to iridectomy. In one of the cases in which one eye was operated on, its vision was retained without further impairment after six years; while the eye submitted to a myotic, although it had been the better of the two, became entirely blind in two years. In the other case the operated eye retained its vision; while the vision of the other slowly deteriorated, until ten years later iridectomy was done on it, and apparently arrested the course of the disease.—*Annales d'Oculistique*, June, 1900.

Glaucoma from Homatropine.—H. GIFFORD (Omaha) reports a case in which an acute outbreak of glaucoma followed the use of homatropine for the measurement of refraction, in a young lady aged twenty-one. Pain set in a few hours after the use of the drug, so severe that she vomited on getting up, and vision was greatly impaired. When seen at the end of two days the tension was + 1, the media were hazy, and vision was reduced to seeing movements of the hand. When examined with the ophthalmoscope, three days later, retinal hemorrhages were found in both eyes. Vision subsequently improved to 20/70 in one eye and 20/20 in the other. Iridectomy was not done, and glaucomatous attacks continued to occur when not held in check by pilocarpin.

Since this experience, Gifford puts one or two drops of a 1 per cent. eserine solution into every eye, which he has tested under atropine or homatropine, before the patient leaves the office, with instructions to return the next day if the near vision is not entirely normal.—*Ophthalmic Record*, July, 1900.

[This case strongly emphasizes the fact that the danger of provoking an attack of glaucoma by dilating the pupil is not confined to persons who have passed forty or forty-five years of age, and it also emphasizes the importance of carefully investigating as to the presence of glaucoma before using a mydriatic in any case. Gifford does not report the ophthalmoscopic appearances

or the previous symptoms in this case. But in most such cases reason for suspicion of glaucoma might have been found before the use of the mydriatic. There have now been placed on record quite a number of cases in which homatropine was the drug that provoked the outbreak of glaucoma. It should be universally understood that, in this connection, it is less dangerous than the other mydriatics only in so far as the dilatation of the pupil it causes may be overcome more quickly.—ED.]

Poisoning by Homatropine and Cocaine.—S. STEPHENSON (London) reports the case of a girl, aged three, who received nine applications of a solution containing 2 per cent. each of homatropine and cocaine to the eyes in ninety minutes. Three hours later she failed to recognize familiar faces, picked at the coverlet, tried to grasp invisible objects, babbled strangely, and persisted in getting out of bed. Her pupils were widely dilated, her face flushed, her lips and tongue parched. There was no eruption. She recovered entirely within twenty-four hours.—*Ophthalmic Review*, July, 1900.

[The symptoms mentioned are those of homatropine poisoning, which are closely allied, but probably not identical with those of poisoning by atropine.—ED.]

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Plague and Rats.—The connection of rats with the spread of plague has long been suspected where the disease is endemic, and, in 1897, YERSIN advanced the proposition that before the disease prevails anywhere among human beings the rats of the locality are first affected. In the infected areas of India it is said that much evidence of direct transmission from mice to man has been collected. An exceptionally good case is related by BELL (*The Lancet*, May 26, 1900), though it is not conclusive, since the possibility of outside infection must be admitted. The victim was an adult Chinaman bitten in the thumb by a rat. The wound was treated by domestic methods, but at the expiration of three days the man sickened and died of plague, the diagnosis of which was confirmed by bacteriological examination.

It has been alleged that the rat acts only indirectly as the carrier of infection and that the immediate agent is the flea which infests him. GALLI-VALERIO, however, asserts (*Centralblatt für Bakteriologie, etc.*, January 6, 1900) that though the fleas which infest rats and mice may contain the plague bacillus in their tissues it has not been proved that they may transmit the

disease to man, and that the most common of the several species will not bite man at all. Certain it is at least that they would not bite him, for he confined specimens on various parts of his body under small watch glasses kept in place for twenty-four to forty-eight hours, and received not a single bite, although the kind that infests man bites him very freely. Possibly, however, some peculiarity of the skin secretions may be the explanation of their refusal to bite. Thus LOIR (*Revue Scientifique*, March 31, 1900, p. 395), being struck with the immunity enjoyed by oil carriers in past epidemics, conceived that this was due to the oil with which their persons and clothing are drenched. He made a number of experiments to ascertain if fleas would invade the fur of a rat soaked in oil, and found that they would not. He took a rat which was swarming with fleas, killed it, and placed its body in a cage in which were confined two other rats, one with normal skin and the other well oiled. When the dead body became cold all the fleas left it and went to the rat with the dry skin, not one attaching itself to the other. Loir concluded that the fleas' aversion for oil might be the explanation of the immunity noticed.

While authorities are not unanimous on the question of the importance of rats in the dissemination of plague, the subject is receiving most serious attention, and in many places a war of extermination has been inaugurated. In Hamburg, for example, an order was issued in the autumn to the police and harbor police to pay five pfennigs for each dead rat delivered before February 10 of the present year. At Aden the reward is a cent apiece for all killed within the limits of the town. At Paris the public authorities have been much stirred up for some years by the rat nuisance, and now, in view of the possibility of invasion by the disease, are especially desirous of preventing new importations and killing off those already on the ground. When the diggers for the Exposition began work some of the neighboring streets, according to *Gesundheit*, No. 4, 1900, were so extensively invaded by rats that the residents dared not leave a child in a yard or garden unattended. The markets swarmed with them, and at night the thickest meat chests were gnawed through. Cats were found of no use against them, since they are so accustomed to being fed and cared for that mice afford them merely a simple means of amusement, and rats are avoided. Where large numbers of them have been placed in the markets it has been observed that at night they affiliate with the rats in a friendly way, and make common cause against the provisions. Poison proved more effective, but only for a time, since rats become wary. Traps are useful, but not adapted to extermination on a large scale, and, moreover, rats soon learn wisdom by experience, and avoid them. Some varieties of dogs are most energetic rat hunters, among them the bull terrier, fox terrier and rat terrier. At the police headquarters four of the latter were used with great effect and were active both day and night.

The problem of exterminating rats by means of bacterial agencies has been studied by J. DANYSZ (*Revue d'Hygiene* and *Annales de l'Institut Pasteur*, April, 1900) with some success. He employed a cocco-bacillus which resembles the bacillus of LOEFFLER (*B. typhi murium*), which is pathogenic for mice. Danyasz isolated his organism from an epidemic among field mice, and found from the beginning that it was slightly pathogenic for gray rats, that is, out of ten specimens fed with a culture of it two or three would die, others

would sicken and recover, and the rest would show no effects whatever. The positive results led to the hope of increasing the virulence by the usual methods of successive inoculations, but the process proved futile, for the virulence was thereby lessened rather than increased. He succeeded, however, by following another method, in attaining the desired results, and obtained cultures which applied to bread were successful in destroying large numbers of the animals in the sewers and shops and on farms. As a special test, on February 2d, 200 gray rats were released in a sewer 160 metres long and 3 metres wide, closed so as to prevent their escape. They were supplied with an abundance of food and straw, and at the expiration of ten days were observed to be alive and well. Then twenty tubes of culture were distributed on pieces of bread, and in eight days they began to die. During the next ten days eighty dead specimens were found, half of which were removed, and the rest left to be eaten by the survivors. On the tenth day but eight were found to be alive, and these through carelessness were allowed to escape. The experiment showed that the animals will eat the soaked bread in preference to other food, as wheat, carrots, etc., and die, and be eaten by the survivors, but that since the virulence becomes attenuated after the third or fourth passage, the culture must be freshly distributed at intervals of ten or twelve days. Young rats proved to be more susceptible than old ones.

A very cheap and effective means of destroying rats and other vermin aboard ships has been suggested by DE FERRARI, the Quarantine Officer of Genoa (*Public Health Reports*, May 11, 1900). It consists in burning charcoal in the hold after all outlets have been carefully sealed. The charcoal, of which 6 kilos are employed for each 100 cubic metres of space, is ignited with the aid of kerosene. The hold is kept closed for eight hours, during which time the poisonous carbon monoxide diffuses and is inhaled by the rats with fatal results.

DR. RUFFER, head of the quarantine office in Egypt, asserts that the danger of spread by rats is much over-estimated, and that up to the beginning of the year no ships had arrived at Suez with any evidence of dead rats aboard, and that in ships infected with the disease there had been no unusual mortality among these animals.

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A CASE OF MALARIA PRESENTING THE SYMPTOMS OF DIS-
SEMINATED SCLEROSIS, WITH NECROPSY.¹

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(From the William Pepper Clinical Laboratory, Phoebe A. Hearst Foundation.)

THE implication of the nervous system in malaria cannot be regarded as a recent discovery. A thesis in which this subject is considered was written by Ouradou in 1851 (Mannaberg). In studying the literature we find references to paralyses believed to have been of malarial origin, and yet the nervous symptoms of malaria do not seem to have attracted attention except from a comparatively small number of observers. Gowers,² in his second edition, refers in a few lines to the occurrence of malarial paralysis of central origin, and he writes as though these cases had not come under his own observation. He speaks of having seen several cases of what was probably malarial neuritis. Malarial neuritis seems to have been observed by the Germans only within the present year (Baumstark, Ewald³).

Clinical cases of paralysis occurring in malaria are reported. A very interesting paper on this subject was published by Gibney.⁴ In speaking of one of his cases he says that the toxic influence on the nerve centres at one time was so profound that neither electric current caused

¹ The report of this case was presented in abstract at the meeting of the American Neurological Association, May, 1900, and the paper was read, by invitation, before the Section of Medicine of the Buffalo Academy of Medicine, October 9, 1900.

² Gowers. "A Manual of Diseases of the Nervous System," English edition, vol. i., p. 151, and vol. ii., p. 899.

³ Baumstark, Ewald. *Berliner klin. Wochenschrift*, 1900, Nos. 37 and 38.

⁴ V. P. Gibney. *The American Journal of Neurology and Psychiatry*, 1882, vol. i., p. 1.

any reaction, and yet recovery occurred. Two of his cases presented the symptoms of acute anterior poliomyelitis.

Suckling¹ reports a case in which paraplegia occurred twice, each time a fortnight after an attack of ague, and in each attack recovery commenced on the third morning after the onset of the paraplegia, and was complete in a few hours.

Suckling refers to a case reported by Romberg as far back as 1853. The attacks of paraplegia occurred suddenly on alternate mornings at the same hour and passed off in a few hours. Sensation was unaffected, but the sphincters were paralyzed. The attacks were soon checked by quinine. Suckling refers to similar cases reported by Harting and Erb.

A case of malarial hemiplegia, in which quinine had a remarkably beneficial effect, is reported by Pascal,² but no necropsy was obtained. Cases of malarial paralysis, both motor and sensory, but without necropsy, have been reported by Stockwell.³ One of malarial paraplegia, without necropsy, is recorded by Hurd.⁴ Boinet and Salebert give references to twenty-four papers in which motor disturbances of malarial origin are described, and at the Eleventh International Congress Boinet⁵ said he had seen many motor disturbances in malaria, such as paralyzes, convulsions, and choreiform movements. Csillag⁶ also has reported cases of malarial paralysis, in some of which recovery occurred after the administration of quinine.

Laveran,⁷ in his recent monograph on malaria, refers to many papers in which paludism is described as being complicated by paralysis of spinal or cerebral origin, and says that he has observed these paralyzes several times. He refers to two cases which presented the symptoms of acute anterior myelitis and were apparently cases of malaria. He observed also a case of malarial hemiplegia, and in speaking of these malarial paralyzes he says that they are sometimes persistent and sometimes transitory.

One of the most recent works on malaria has come from the pen of Mannaberg.⁸ He also refers to a number of clinical cases of malarial paralysis, and acknowledges that most of the cases of nervous disease resulting from malaria are without any study of the lesions. Neuro-pathologists, he says, have treated malaria in a "stepmotherly" fashion.

¹ C. W. Suckling. *Brain*, 1888, vol. x., p. 474.

² J. Pascal. *Archives de Médecine et de Pharmacie Militaires*, 1887, vol. x., p. 145.

³ G. A. Stockwell. *The Medical and Surgical Reporter*, March 17, 1888, p. 323.

⁴ A. W. Hurd. *Buffalo Medical and Surgical Journal*, 1888-1899, vol. xxviii., p. 19.

⁵ Boinet. *Eleventh International Congress*, 1894, vol. iii.; *Internal Medicine*, p. 82.

⁶ J. Csillag. *Wiener med Presse*, 1895, p. 1323.

⁷ A. Laveran. "*Traité du Paludisme*," 1898.

⁸ J. Mannaberg. "*Die Malaria-Krankheiten*," Nothnagel's "*Specielle Path. und Ther.*," vol. ii., Part II.

J. J. Putnam observed a case (unpublished) in which temporary hemiplegia, believed by him to have been the result of malaria, occurred. The patient recovered, except that weakness and paræsthesia persisted in the thumb.

I had the opportunity to observe on one occasion recently, with Dr. C. K. Mills, a case of malaria with implication of the nervous system, in the wards of Dr. Alfred Stengel, at the Philadelphia Hospital, and I am indebted to Dr. Stengel for permission to publish the clinical notes.

The patient, a man, sixty-three years of age, previously healthy, who had been living in a malarial district and had been bitten by mosquitoes, became dizzy while walking on the street, and began to stagger, and had to grasp a pole for support. Since then he had occasionally attacks of vertigo. Since the second day of this indisposition he had a feeling of chilliness every other day about 4 P.M. His speech was slow and more hesitating than it had formerly been, and he is said to have had an intention tremor of his hands. He was weak in the lower limbs, especially below the knees, and his gait was very ataxic. The pupils were equal, and the irides reacted promptly to light and in accommodation. The splenic dulness was slightly enlarged on percussion, but the spleen was not palpable. The malarial parasites were found in the blood by Dr. Shiffert. The patient came to the hospital August 29, 1900, and was put on large doses of quinine. He was dismissed as cured on October 12, 1900. The gait had become normal, the ataxia had disappeared, the chills had ceased, but the speech was still peculiar.

We have, therefore, abundant evidence that monoplegia, paraplegia, hemiplegia, aphasia, convulsions, and various forms of tremor have been observed in persons suffering from malaria, but it is not so certain that in all the reported cases malaria has been the cause of these symptoms. The diagnosis seems to have been made most frequently from the results obtained by the administration of quinine, and in many cases the malarial organism is not even referred to; in other cases syphilis may have been, at least partly, the cause of the symptoms, and in comparatively few of these cases to which reference is made by the different writers has the malarial parasite been found in the nervous tissues. It is possible, I think, that malaria may cause paralysis; we have sufficiently carefully observed cases to warrant this belief. It is important to know in what way these paralyzes are produced.

As a rule, the paralysis of malaria is not permanent; but occasionally it is, and quinine has no effect. A case of cerebral and meningeal hemorrhage, with capillary hemorrhages in the brain, occurring in a case of quotidian fever, was reported by Blanc.¹ Mannaberg² says that the capillary hemorrhages are more common in malaria than the large extravasations of blood, and still more common are the disturb-

¹ H. Blanc. *Archives de Médecine et de Pharmacie Militaires*, 1887, p. 451.

² Loc. cit.

ances due to closure of cerebral or spinal vessels by infected red blood-corpuscles. Changes in the ganglion cells are supposed to occur as a result of the poison. The small cerebral vessels have been found plugged with the malarial parasites in a number of cases. The punctiform hemorrhages found in the brain, according to Bastianelli and Bignami (cited by Mannaberg), are usually in the white matter, more rarely on the border of the white matter with the cortex, and are not commonly seen within the cortex. This seems to be rather an extraordinary statement, as the cortex is better supplied with vessels. I am more inclined to accept Blanc's statement (cited by Mannaberg) that most hemorrhages in malaria occur near or within the cortex. I have found quite a number of hemorrhages in the cortex in my case.

According to Laveran,¹ it is not uncommon to find a great injection of the meninges and of the convexity of the brain, even acute meningitis, in those who have died in delirium or coma from pernicious malarial fever. The color of the cortex and gray matter elsewhere is a deeper gray in these cases than is normal, and pigmented elements are found within the capillaries in microscopical examination. The capillaries are not always equally affected in all parts. The endothelial cells of the capillaries are often swollen, and this tumefaction aids in the formation of parasitic thrombi. Laveran makes a statement of great clinical importance. The papilla of the optic nerve, he says, has often a grayish tint, due to the presence of pigmented elements in the small vessels, and this discoloration may be detected during life. This may possibly be of value in those cases in which the parasite cannot be detected in the blood during life.

The absence of the malarial organism in the peripheral circulation is no proof of its absence elsewhere in the body. Thayer² says that in infections with the æstivo-autumnal variety only the earliest stages of its development are ordinarily to be found in the peripheral circulation, while occasionally, perhaps, in most severe infections prolonged examinations of the blood from the peripheral vessels reveal little or nothing.

In the discussion of a paper on the presence of the malarial parasite within the central nervous system, presented by Marinesco³ to the Society of Biology of Paris, Laveran reiterated the statement that the parasite is found within the capillaries of the nervous system in all persons who have died from pernicious fever with cerebral symptoms.

A paper of great value by Councilman and Abbott,⁴ published in 1885, gives a description of the brain and cord in two cases of malaria that would apply almost equally well to my case. This paper was one of

¹ Loc. cit.

² W. S. Thayer. "Lectures on the Malarial Fevers," 1897, p. 62.

³ G. Marinesco. *Comptes-rendus de la Soc. de Biologie*, 1899, p. 219.

⁴ Councilman and Abbott. *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, 1885, p. 416.

the first in which the malarial parasite was seen within the central nervous system. As in my case, the bloodvessels under a low-power lens appeared as if they were artificially injected with a black granular mass, and there was scarcely a capillary in the gray substance of the brain that did not contain these bodies in greater or less numbers.

More recently Ewing¹ has described cases of malaria in which the malarial parasites were present in great numbers in the central nervous system.

Thayer² believes that many of the cerebral symptoms of malaria may be due to a circulating toxic substance, the presence of which we cannot but acknowledge is highly probable.

The alteration of the blood occurs rapidly in severe malaria, and to this alteration, according to Laveran, are due the œdema and hemorrhages found in malarial infection. The thrombi formed by the parasites may cause foci of softening and motor paralysis if the motor areas are implicated. I have not been able to find a statement as to whether Laveran or anyone else has seen degeneration of the motor tract resulting from a lesion of malarial origin, as has been observed in the case I report.

Malarial paralysis, therefore, has been supposed by some to be the result of malarial cachexia (Gubler); by others as the result of congestion of the nervous centres (Maillot, Ouradou, Jaccoud, Grasset); by others as the result of an alteration of the blood (Kindfleisch); by others as the result of rupture of small capillary aneurisms filled with pigment (Kelsch).

Pugibet³ quotes these opinions in reporting cases of chronic dysentery or diarrhoea with symptoms of implication of the nervous system.

The case of malaria I have to report was one with the symptom-complex of disseminated sclerosis, largely unilateral. The patient was in the service of Dr. Dercum at the Philadelphia Hospital, and to him I am indebted for the pathological material and the clinical notes. I had the opportunity to observe this patient quite frequently, and recognized the resemblance of the case to one of multiple sclerosis. He was presented by Dr. Dercum⁴ before the Philadelphia Neurological Society, May 31, 1897 :

H. A., white, male, aged forty years, born in Sweden, a sailor, was admitted to the Philadelphia Hospital, September 5, 1896, and died there September 23, 1899.

Family History. His mother died of phthisis; three brothers and three sisters are living and well.

Previous History. He enjoyed good health until his present trouble

¹ Ewing. *Journal of Nervous and Mental Disease*, 1899, p. 701.

² Loc. cit.

³ J. Pugibet. *Revue de Médecine*, 1888.

⁴ F. X. Dercum. *Journal of Nervous and Mental Disease*, November, 1897, p. 704.

began. He had a chancre in 1871. In December, 1895, he suffered from headache, vertigo, drowsiness, and diplopia. At this time he lost power in the left side suddenly, without loss of consciousness. Four years previously he lost power in the right side for four weeks.

Present Condition, November 5, 1896. His sway is decidedly increased on making the Romberg test. He stands unsteadily on the right foot alone, and cannot stand on the left foot alone because of ataxia. In walking the left foot is swung awkwardly upward and outward, and strikes with the flat of the sole upon the ground. The movements of the right foot are apparently normal. When the patient lies on his back and is asked to move the legs he has marked ataxia of

FIG. 1.

Photograph of the patient with the symptoms of disseminated sclerosis. The somnolent expression is imperfectly reproduced (Photograph obtained from DR. C. Y. WHITE.)

the left leg and a very slight degree of ataxia of the right leg. The ataxic movements of the left leg are somewhat jerky in character. The movements of precision are all well executed with the right hand. The movements of the left arm are excessively ataxic and jerky. When he is told to place a finger of his left hand upon his nose the limb is moved clumsily until it approaches the neighborhood of the nose, and then lateral or to-and-fro oscillatory movements, jerky in character, occur, becoming more intense with the degree of effort made. No tremor is observed in the right hand, but slight unsteadiness of the limb as a whole is detected. In the left hand tremor is on movement, but coarse up-and-down movements are provoked by extending the forearm with the fingers separated.

Face: The man has a pronounced expression of somnolence. The eyebrows are raised, as though he were making an effort to keep awake. The lines of the face, except those of the forehead, are comparatively smooth. The face appears relaxed. The head is held slightly inclined

to the right shoulder. The face is somewhat asymmetrical, the left side appearing larger. There is no sign of facial palsy and no tremor of the lips. The tongue is protruded slowly, and its movements are slightly irregular. The pupils respond normally and are equal in size.

FIG. 2

An instantaneous photograph. The left upper limb is blurred because of the tremor, but the blurring has in large measure disappeared in the reproduction. The expression of the face is striking. (Photograph obtained from Dr. F. X. DEACUM.)

The movements of the eyeballs appear to be normal. There is marked vertical nystagmus. The right eyelid seems to droop slightly, and the right palpebral fissure is much smaller than the left.

November 17, 1896. The patient has never had any bladder or rectal trouble. The sphincters are normal. He has no sensory disturbances. The reflexes:

	Right.	Left.
Knee-jerk . . .	+	normal, possibly slightly —.
Ankle clonus . .	slight	none.
Elbow-jerk . . .	+	normal, or slightly —.
Biceps-jerk . . .	+	" " "
Wrist-jerk . . .	+	" " "

Subjective Symptoms. H. A. has no headache at present, but says he had headache, giddiness, and ringing in the ears for five years until the fall of 1895, at which time he was relieved by medicine. He has not had convulsions or attacks of unconsciousness or pain in the bones.

Superficial reflexes: The right plantar is marked, and the left is excessively so. He has no toe reflex (by this is meant the reflex described by Sinkler, and consisting in the drawing of the lower limb upward when the great toe is forcibly flexed). The superficial reflexes of the thigh and abdomen are much increased.

Ocular examination by Dr. de Schweinitz, December 1, 1896: "The pupillary reflexes are normal. The optic examination is negative except that there is possibly slight oedema over the disk. No muscular defect is evident."

March 26, 1897. Nystagmus is present when the patient looks toward the extreme right. The right knee-jerk is very large and spastic; the left knee-jerk is normal. The ankle clonus on the right side is slight, and none is observed on the left side. The biceps-jerk and the muscle-jerks in the arms are all good. The chin-jerk is present. Sensation of the hands is normal.

October 13, 1898. H. A. was seen by Dr. Dercum, and a diagnosis of insular sclerosis was made, perhaps specific in character.

December 20th. H. A. fell to-day against steam-pipes and burned his right thigh on the outer side, but not seriously.

22d. The man is fully able to be about the ward, and has no pain.

29th. The ulcers are healing nicely.

September 1, 1899. The patient is up and moves about the ward daily, but is very weak and moves with difficulty. It is difficult to understand what he says, on account of scanning speech.

18th. He has had diarrhoea for several days, and his weakness seems to be increasing.

20th. He is slowly failing.

22d. The diarrhoea has ceased for several days, and he is very weak.

23d. The patient died early this morning.

The necropsy was performed by Dr. T. S. Kirkbride, Jr., and the necropsical notes were made by him:

September 23, 1899. Body of a fairly well-formed, poorly nourished male. *Rigor mortis* not present. Both layers of peritoneum smooth and glistening. Position of organs normal. The left pleural sac contains a moderately increased amount of clear, straw-colored fluid. Over the lower part of the left lobe the pleural layers are adherent. The right pleural sac contains an increased amount of fluid, but there are no adhesions. Both layers of pericardium are smooth and glistening. The sac contains a considerably increased amount of clear, straw-colored fluid.

Heart. Both ventricles contain currant-jelly clots and a small quantity of fluid blood. The valves are all normal and are not thickened. The muscle is dark brown in color and somewhat friable.

Lungs. The upper lobe of the left lung is moderately emphysematous, as is also the lower lobe at its anterior margin. On incision into the lower lobe a large quantity of brownish-yellow and reddish-brown fluid exudes. The mucous membrane of the bronchi is reddish-brown in color, and is covered by a considerable amount of mucus. Scattered foci of consolidation are found in the lower lobes. The right lung resembles the left. The œdema is less marked and foci of consolidation are not so numerous.

Spleen. The spleen is much enlarged; its capsule is tense and color dark slate; consistence soft. The cut surface shows the pulp in semi-fluid condition and easily scraped off in considerable quantity.

Suprarenals. Left is normal, as is also the right.

Left Kidney. The left kidney is small and its capsule is moderately adherent, leaving finely granular surface on removal. The cut surface shows the cortex broad and yellowish in color. In the pyramids are yellowish bands alternating with reddish. The consistence is perhaps slightly increased.

Right Kidney. The capsule is only slightly adherent and the surface is fairly smooth. The cortex is of moderate width and yellowish in color.

Bladder. Walls are thin, the bands of muscles standing out prominently.

Duodenum is normal.

Stomach. The mucous membrane on the summit of the folds is injected, and the surface of the membrane is covered with a mucous exudate.

Liver. The right lobe is large, the surface is smooth, and of dark slate color. The cut surface is slightly uneven and granular in places in the right lobe; the parenchyma has a loose, spongy appearance (Schaumleber?).

Brain. Dura was tightly adherent over the right lobe of the cerebellum, and was, therefore, removed with the brain. The cerebrospinal fluid was increased in amount.

Pathological Diagnosis. Multiple sclerosis(?), emphysema of lungs, œdema of lungs, bronchopneumonia, acute splenic tumor, parenchymatous nephritis.

Heart weighed	.	.	.	.	.	370 grammes.
Left lung weighed	.	.	.	.	.	950 "
Right lung	"	.	.	.	.	955 "
Spleen	"	.	.	.	.	550 "
Left kidney	"	.	.	.	.	160 "
Right kidney	"	.	.	.	.	160 "
Liver	"	.	.	.	.	1890 "
Brain	"	.	.	.	.	1450 "

A brief abstract of the case is as follows:

H. A. was born in 1856, and had been in fairly good health, so far as can be determined, until about 1890. He had a chancre in 1871. His occupation as a sailor probably exposed him to malaria, with which he became infected. In 1891 he lost power in the right side of his body. The hemiplegia was slight and disappeared altogether in four weeks, and was not accompanied by loss of speech. It was due to organic change within the central nervous system. In December, 1895, he began to have headache, vertigo, drowsiness, and diplopia,

although he had suffered from headache, dizziness, and ringing in the ears for five years, until the fall of 1895, when he was relieved by medicine. About December, 1895, he suddenly lost power in the left side of the body, but the attack of weakness was not accompanied by any loss of consciousness, and was not caused by lesion of the pyramidal tract innervating this side, as shown by the normal condition of this tract in the microscopical examination. He recovered power on this side quite rapidly, but ever since has had difficulty in walking, and has not been able to hold objects well with his left hand.

When he was examined on November 5, 1896, his sway was decidedly increased on making the Romberg test. He stood unsteadily when resting only upon the right foot, and was entirely unable to stand alone upon the left foot, on account of ataxia and not of weakness. The movements of the left lower limb were very ataxic, but those of the right lower limb seemed to be normal. He had some unsteadiness of the right upper limb on movement and very pronounced intention tremor in the left upper limb. He presented a very somnolent appearance. Marked vertical nystagmus was easily elicited. The speech was decidedly scanning. The knee-jerk was exaggerated on the right side, but was normal on the left, and ankle clonus existed only on the right side. The tendon reflexes of the right upper limb were exaggerated.

These symptoms persisted with little or no change until the patient contracted a diarrhoea, which lasted over a week and terminated in death on September 23, 1899.

The temperature-chart taken during the last few days of his life is published with this article (Fig. 3). A chart made three years previously showed a slightly subnormal temperature.

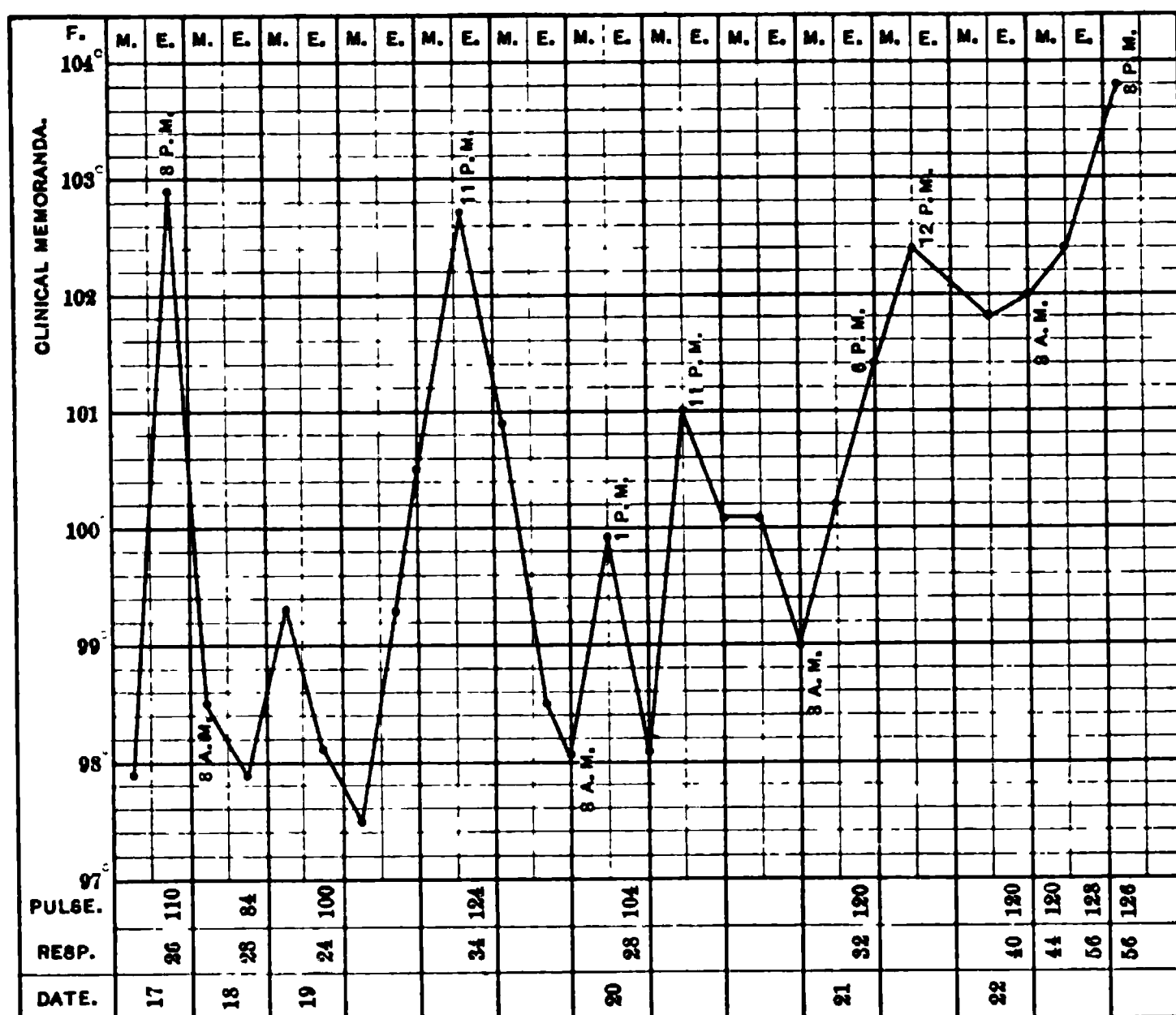
An interesting finding at the necropsy was the enlarged spleen. The diarrhoea which was so severe just before death, and which possibly caused a fatal termination by exhaustion, was probably malarial in character. The æstivo-autumnal form of parasite, according to Thayer,¹ may cause a clinical picture very closely resembling that of Asiatic cholera—*i. e.*, sudden, profuse watery diarrhoea, associated with intense prostration, the patient sinking into an algid condition. This attack may be rapidly fatal, and usually is so without treatment.

The right crossed pyramidal tract in the case H. A. is moderately sclerotic throughout the spinal cord; this sclerosis is by no means intense, but it is unmistakable. It is sufficiently pronounced to indicate that the focal lesion in the pyramidal tract producing the secondary degeneration could not have been very extensive. The sclerosis consists merely of slightly thickened bands of neuroglial tissue here and there within the right crossed pyramidal tract, and seems to be especially marked about the small vessels of this tract, although it is also found apart from the vessels. The cells of the anterior horns appear to be normal by the ammonium-carmin stain; they are of normal shape and have centrally situated nuclei. The left direct pyramidal tract presents no distinct evidences of sclerosis. The right anterior horn is smaller

¹ W. S. Thayer. "Lectures," p. 152.

than the left throughout the spinal cord, but it does not seem probable that the relative smallness of the right anterior horn could result from the very moderate degree of degeneration of the right crossed pyramidal tract. The cells in the right anterior horn are about as numerous as those in the left. No recent degeneration of the spinal cord is found by the Marchi method. An area of slight sclerosis is observed in the outer portion of the middle third of the foot of the left cerebral peduncle. A small hemorrhage is found in the posterior limb of the left internal capsule. This hemorrhage has the appearance of one of

FIG. 8.

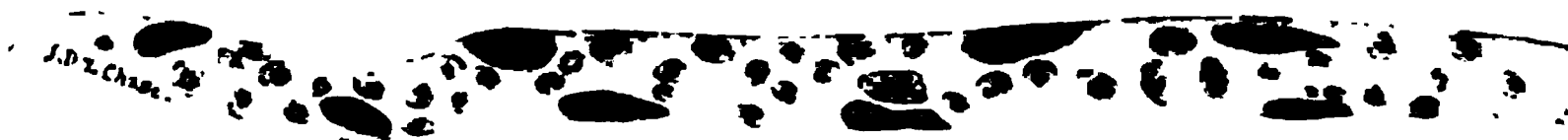


recent origin. The sclerosis of the pyramidal tract from the left hemisphere cannot be traced above the lower part of the posterior limb of the left internal capsule. Numerous small recent hemorrhages are found in the left paracentral lobule and other parts of the cortex, and occasionally the malarial parasites are found within these hemorrhages. The giant cells of the paracentral lobule appear to be normal with the ammonium-carmin stain. The small bloodvessels throughout the brain and cord are filled with the malarial parasites.

Transitory paresis of the right half of the body, and four years later a similar hemiparesis of the left side, in connection with the other symptoms, made the existence of disseminated sclerosis seem very probable. Transitory paralysis is well known as a sign of this disease. The paralysis could hardly have been the result of syphilitic

disease of the nervous system, because no lesions resembling those of syphilis were detected with the microscope. Whether the right-sided paralysis was greater in intensity than that observed on the left side I cannot say, but I find sufficient changes within the central nervous system to explain the right hemiparesis. The motor tract from the left hemisphere is partially sclerotic, and this sclerosis can be traced throughout the right crossed pyramidal tract into the left cerebral peduncle and lower part of the left internal capsule, and is lost within the left internal capsule. The sclerosis was too slight to cause a persistent and intense paralysis of the right side of the body, but it was sufficient to produce distinct symptoms. The man stood unsteadily when resting upon the right foot, and this was not due to ataxia, which did prevent him from standing upon his left foot alone. Notwithstanding the moderate degree of sclerosis of the motor tract from the left cerebral hemisphere, the movements of the right foot and leg appeared to be normal. Exaggeration of knee-jerks and ankle clonus on the right side were further evidence of the implication of the right crossed

FIG. 4.



Malarial parasites within a capillary of the central nervous system, as shown in one focus. The full number of parasites in any vessel can be determined only by changing the focus.

pyramidal tract. On the left side the knee-jerk was normal and ankle clonus was absent, and there was no sclerosis in the left crossed pyramidal tract.

The cause of the partial sclerosis of the motor tract from the left hemisphere was probably the occurrence of small hemorrhages. I have found hemorrhages of recent formation within the left internal capsule in its posterior limb and in many parts of the cerebral cortex, and it seems probable that if recent hemorrhage occurred similar lesions may have developed at earlier periods. In the seven or eight years which elapsed between the attack of right hemiplegia and death all evidences of these hemorrhages, except the slight secondary degeneration and sclerosis, had disappeared. The left cortex showed no lesions except the closure of the capillaries by the parasites and recent hemorrhages, and this explains the absence of aphasia in the right hemiparesis.

I have found no explanation for the transitory weakness of the left side of the body. This also may have been due to small hemorrhages, but if so the hemorrhages were either not directly in the motor tract or were not sufficient to cause secondary degeneration.

This patient presented the clinical picture of disseminated sclerosis. His symptoms of the disease were:

1. A very marked intention tremor of the left upper limb. As the left hand approached the desired object the tremor became excessive and exactly like that seen in disseminated sclerosis.

2. Marked ataxia of the left lower limb. The left foot was swung awkwardly upward and outward in walking, and struck with the flat of the sole upon the ground. When the patient lay upon his back he showed marked ataxia in movements of the left lower limb. The ataxia of the left lower limb was so great that the patient was unable to stand upon this limb alone.

3. Transitory hemiparesis, first of one side of the body, then of the other.

4. Headache, vertigo, drowsiness, and diplopia.

5. Marked vertical nystagmus readily elicited.

6. Speech that was distinctly scanning.

7. Tendon reflexes exaggerated on the right side, with ankle clonus on the same side.

A few cases of disseminated sclerosis attributed to malaria are reported, but none with necropsy as far as I have been able to study the literature.

Canellis¹ reports the case of a man, aged forty-two years, who had had intermittent fever and malarial cachexia. He believed that malaria was the cause of the symptoms in the typical clinical picture of disseminated sclerosis observed in this case. Quinine had no effect. No finding of the parasite in the blood is reported and no necropsy was obtained, as the man was still living at the time the paper was written. Boinet and Salebert² refer to pseudodisseminated sclerosis from infection, described by Kahler and Pick, and by Marie, and they report a case of malaria which resembled one of disseminated sclerosis. There was no necropsy. This patient, a man, had paraplegia with preservation of the reflexes, tremor of the head and of the lower limbs on voluntary movement.

In a case of malaria reported by Triantaphyllidès³ the speech was slow and scanning and "absolutely characteristic," according to the author, of disseminated sclerosis. In repose the patient, a man, aged twenty-six years, who had had malarial fever until five days previously, presented no tremor, but in attempting to carry the hand to the mouth tremor appeared in the hand, and increased in amplitude if the movements were continued. Distinct nystagmus was present. The tendon reflexes of all the extremities were exaggerated, and vertigo was complained of. The liver and spleen were enlarged and malarial para-

¹ S. Canellis. *Gazette Hebdomadaire de Médecine et de Chirurgie*, second series, 1887, vol. xxiv., p. 554.

² Boinet and Salebert. *Revue de Médecine*, 1889, p. 933.

³ Triantaphyllidès. *Archives de Neurologie*, 1893, vol. xxvi., p. 232.

sites were found in the blood. This was the patient's condition on October 13, 1892. Quinine was administered. On October 26th the signs of disseminated sclerosis were much less distinct, and by November 11th they had disappeared. This was regarded as indisputably a case of malaria. Triantaphyllidès remarks that it would be interesting to know whether cases similar to his, not treated, would terminate in true disseminated sclerosis. To this question the study of the case I report permits the reply that the symptoms of disseminated sclerosis from malaria may probably exist for at least eight or nine years, and possibly longer, without any formation of disseminated sclerotic foci in the central nervous system.

Torti and Angelini¹ observed two cases of chronic malaria in which the symptoms of disseminated sclerosis were seen during the apyrexia. One case was as follows: A man, aged twenty-one years, after having had malarial fever of irregular type for three months, in October and November had vertigo and vomiting; later he had weakness of the legs, scanning speech, exaggerated tendon reflexes, intention tremor, and ataxia of the upper limbs, slow reaction of the iris, and slight nystagmus. Temperature and sensation were then normal. The vertigo and vomiting persisted and increased in intensity. The malarial parasites were found in the blood. After administration of quinine and Fowler's solution the symptoms became much less marked, and the parasites disappeared from the blood. At the end of December the patient again developed fever, and after a few days had spastic paresis and ataxia of the extremities, nystagmus, tremor, exaggerated reflexes, scanning speech, headache, and vertigo; and the malarial parasites were again found in the blood. The symptoms again disappeared in great measure.

The other patient, a man, aged twenty-two years, with normal temperature, but who was very anæmic, had headache, vertigo, scanning speech, nystagmus, intention tremor of the hands, exaggeration of the tendon reflexes, but normal sensation. These symptoms developed in November, after he had had malarial fever in August and September. Malarial parasites were found in the blood. After treatment for three weeks with quinine and Fowler's solution the patient was discharged cured.

Two cases with the symptoms of disseminated sclerosis, in which the malarial parasite was found in the blood, were reported by Bignami and Bastianelli.²

Torti and Angelini believe that the cause of the symptoms in disseminated sclerosis occurring in malaria is an intoxication of the nerve centres, and not vascular disease.

¹ Torti and Angelini. Abstract in *Neurologisches Centralblatt*, 1893, p. 858.

² Bignami and Bastianelli. Cited by Torti and Angelini.

In 1895, Triantaphyllidès¹ published three cases of malaria with the symptoms of disseminated sclerosis. Whether or not his former case was included in these I cannot say. He found the parasites in the blood.

J. J. Putnam² says he saw a case that suggested a relation between malaria and disseminated sclerosis. A man, in middle life and of good health, was attacked suddenly with characteristic and progressive intention tremor and scanning speech immediately after a sharp malarial attack. Under treatment by arsenic there was a slight improvement, but for the most part the symptoms persisted.

It is well known that Marie³ has regarded infectious diseases as a cause of disseminated sclerosis, and the symptoms of disseminated sclerosis occurring in malaria might offer some support to his views, seeing that no necropsies have been obtained, with the exception of the one I now report. The symptoms of disseminated sclerosis occurring in malaria usually disappear after the administration of quinine, and could not, therefore, be due to disseminated foci of sclerosis. Malaria is given by a number of writers as a cause of disseminated sclerosis, apparently without any knowledge on the part of some that this malarial disseminated sclerosis is probably a pseudosclerosis. Oppenheim,⁴ however, has clearly recognized this fact, for he mentions that a form of pseudosclerosis curable by quinine is said to result from malaria.

It is interesting to know that symptoms resembling those of tabes are said to have been due to malaria (Mannaberg), and Dr. C. K. Mills has mentioned to me a case which seemed to be of this character.

The patient H. A. had excessive ataxia and tremor in the left extremities, although he had a very slight degree of ataxia in his right lower limb and some unsteadiness of the right upper limb. The difference between the ataxia of the limbs of the two sides of the body was most striking. The explanation of this must be found in the moderate sclerosis of the motor tract from the left cerebral hemisphere. In the discussion following the presentation of the patient by Dr. Dercum at a meeting of the Philadelphia Neurological Society, Dr. Wharton Sinkler⁵ said he had had a patient under his care who had disseminated sclerosis, with marked intention tremor on both sides. This man became paralyzed on the left side. He partially recovered from this paralysis, and the tremor disappeared entirely on the hemiplegic side, while it remained unchanged on the other.

Mannaberg⁶ saw a patient with paralysis of the right extremities

¹ Triantaphyllidès. Abstract in *Revue de Médecine*, 1896, p. 877.

² J. J. Putnam. *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, March, 1895.

³ P. Marie. *Progrès Méd.*, 1884, vol. xii., p. 287.

⁴ H. Oppenheim. "Lehrbuch der Nervenkrankheiten," second edition, p. 262.

⁵ Sinkler. *Journal of Nervous and Mental Disease*, 1897, p. 706.

⁶ Loc. cit.

from a lesion in the pons. This man contracted malaria, and during the chill is said to have had tremor only on the left side.

In the case H. A. the malarial parasites were as numerous on one side of the central nervous system as on the other. There must have been an abnormal irritation of centres and tracts, and the tremor might have been expected to be equally great on the two sides of the body. One pyramidal tract was partially sclerotic, and the limbs innervated by this tract showed scarcely any ataxia or tremor. The sclerosis must, therefore, have counteracted the irritation produced by the parasites. When movements were made with the left limbs the normal flow of impulses was disturbed. The centres were probably in an abnormal condition of irritation, and the proper degree of muscular contraction could not be gauged, hence the intention tremor and ataxia. The centres for the right half of the body were doubtless in a similar state of abnormal irritation, and excessive and inco-ordinate impulses were sent out from these centres, but excessive action was checked by the degeneration of some of the motor fibres.

We should not speak of tremor in disseminated sclerosis, according to Strümpell,¹ but should describe the disturbance of voluntary movements as ataxia. On the other hand, Oppenheim² says that the tremor of multiple sclerosis is so peculiar as to be almost pathognomonic of the disease.

Leyden and Goldscheider³ can find no satisfactory explanation for intention tremor. According to Charcot, it is due to loss of the medullary sheaths of the nerve fibres and the disturbed conduction of impulses thereby. Erb has been more inclined to attribute the cause to certain locations of the lesions. Leyden and Goldscheider think that foci of sclerosis in the cerebrum and pons are especially liable to cause this form of tremor, although it may possibly be due to lesions of the spinal cord and medulla oblongata. The truth is, we do not understand the cause of intention tremor, and no theory is fully satisfactory.

It might be thought extraordinary that the malarial organisms should have remained so many years in the person of H. A. and have caused no more characteristic manifestations of malaria; and I do not assert that they were present during all this period, but no other cause for the symptoms of disseminated sclerosis was found by the microscopical examination, and it is possible that the parasites were not always as numerous as they were at the time of death. Malaria sometimes persists in spite of treatment, though the symptoms may cease for a time, and a return of the symptoms is not necessarily a proof of reinfection. The case I report has much in common with some of the other cases

¹ Strümpell. "Lehrbuch der speciellen Pathologie und Therapie," vol. iii.

² Oppenheim. "Lehrbuch."

³ Leyden and Goldscheider. Nothnagel's "Specielle Pathologie und Therapie," vol. x., p. 463.

of malaria with the clinical picture of disseminated sclerosis, and such symptoms as were present in H. A. must have had a very definite cause. Some statements made by 'Thayer' throw light upon the question :

“ Golgi long ago pointed out, as a regular rule, that the severity of the symptoms in malarial fever was to a certain extent in direct relation to the number of parasites present, and clinical experience has tended largely to support this view. . . . The æstivo-autumnal organism often undergoes the greater part of its development within certain special organs, and this localization of the parasite may differ materially in different cases. Thus, while in many cases the parasite may be found with equal frequency in all internal organs, in others certain special parts may be involved. In some instances the spleen, in other *parts of the central nervous system* [italics are mine], in others the gastro-intestinal tract, may be the main seat of the infection. In these cases, as one might naturally expect, the clinical symptoms often point directly to the seat of localization.” (Page 146.)

“ In a certain number of instances malarial infections may cause distinct symptoms, with little or no fever. . . . Usually the fever is practically absent, the temperature really being subnormal during the greater part of the time.” A chart in the case H. A., taken three years before death, shows a subnormal temperature. I quote further from Thayer: “ We have observed the same condition in a number of instances of æstivo-autumnal infection. These cases may show for some time a normal or even subnormal temperature, with more or less subjective symptoms. These symptoms are especially likely to be nervous—severe headache, neuralgias, and sometimes, indeed, other interesting nervous phenomena. In several instances the patients showed, beside headache, a sensation of dizziness, together with a markedly unsteady ataxic gait. The blood showed typical æstivo-autumnal organisms, both small amœboid, intracorpuscular bodies, and crescentic and ovoid forms.” (Page 174.)

The quotations are sufficient to show that it is possible that in the case H. A. the malarial parasites may have been present during many years only in parts of the central nervous system, and in smaller number than at the time of the patient's death ; that the absence of fever and of periodic attacks, and the subnormal temperature observed three years before death do not militate against the diagnosis of malaria ; and that the symptoms presented by H. A. are such as are known to occur in the larvated forms of malaria. The long duration of the symptoms is remarkable ; but who will venture to fix a definite limit of time to symptoms of the larvated forms of malaria, especially when quinine is not administered ?

¹ W. S. Thayer. “ Lectures on the Malarial Fevers.”

It might be suggested that the case was one of hysteria, with malarial infection occurring a short time before death. No one, I think, who saw the case regarded it as one of hysteria. The somnolent expression of the man was so extraordinary that should I again observe a patient with a similar expression I should at once think of the possibility of malarial infection. The expression might well be the result of invasion of the brain by the parasites. The slight but unmistakable sclerosis of the right crossed pyramidal tract, and the well-defined small area of sclerosis of the outer part of the middle third of the left cerebral crista, can best be explained as the result of one or more small hemorrhages of ancient date in the left motor tract, similar to those of recent date found in many parts of the central nervous system. The presence of altered blood pigment confirms this view. It would be difficult to explain this slight sclerosis of one motor tract in any other way, and the only apparent cause for these hemorrhages is in the presence of the parasites. No lesions resembling those of syphilis can be found anywhere.

Torti and Angelini¹ distinguish clinically three forms of malaria with symptoms of disseminated sclerosis:

1. Cases in which the symptoms of multiple sclerosis are transitory and are present only during the attack of malarial fever.
2. Cases in which the symptoms of multiple sclerosis appear after the fever and are of varied duration.
3. Cases in which the symptoms of multiple sclerosis appear suddenly, without any fever. The last must, therefore, be a larvated form of malaria.

The few studies on the condition of the nerve cells in malaria which have been made indicate that little alteration of these cells occurs. It is true that Monti found certain alterations with the silver stain, but this method is not one of the best for the study of pathological changes. Laveran² says that the nerve cells are usually unaltered, and Marinesco³ was unable to find important lesions of the nerve cells. A few were altered, and this alteration he thought might be due to the very advanced age of the patient. Marinesco was also unable to find the parasites outside of the bloodvessels except in some small hemorrhages, and a similar statement may be made in regard to the sections studied by me. I have not been able to find any distinct alteration of the nerve cells by the ammonium-carmin stain, and it seems probable that if any changes of importance had existed during a malarial infection of many years they would have been detected by this method. The material was hardened in Müller's fluid, and I was, therefore, prevented from using the Nissl stain.

¹ Loc. cit.

² Loc. cit.

³ Loc. cit.

The great majority of the cases of malaria with nervous symptoms are, according to Mannaberg,¹ due to the æstivo-autumnal variety of the parasite, and Thayer² says that the more severe æstivo-autumnal fevers of Rome are much more acyclical in their manifestations, tend frequently to become pernicious, and are more resistant to quinine. This form of malarial fever is chiefly characteristic of intensely malarious districts, particularly of those regions in the tropics where the pernicious fevers are common. The æstivo-autumnal form was also found by Ewing in some of his cases of implication of the nervous system in malaria, and it is this form which is present in the case H. A. In my preparations the pigment is found at the centre of the parasite, which, according to Thayer,³ is indicative of full development of the organism. It is no exaggeration to say that every capillary of the central nervous system is filled with the organisms, so that the appearance under a low power is like that presented by injection with some black powder. The small vessels of the pia also contain the parasites.

There could be no doubt that these organisms found within the central nervous system were the malarial parasites, but the determination of the variety was more difficult, and I am, therefore, much pleased to have the opinion of Dr. Alfred Stengel and Dr. W. S. Thayer, both of whom examined my sections, that these parasites were of the æstivo-autumnal form.

The case shows that the symptoms of disseminated sclerosis may result from irritative vascular lesions, or imperfect nutrition, or poisoning of the nerve cells, without the formation of multiple sclerotic foci. Multiple sclerosis is chiefly a disease of inco-ordination. Ataxia, intention tremor, scanning speech, and nystagmus are all symptoms of inco-ordination, and it would seem that this inco-ordination may be caused either by the production of abnormal impulses from irritation, as in my case, or by the partial arrest of normally produced impulses in the multiple sclerotic areas of true insular sclerosis.

I found groups of bacilli within the vermis of the cerebellum, and only within this part. Possibly these were of post-mortem origin, but it is singular that they were seen only in the vermis. The malarial bacilli described by Klebs and Tommassi Crudeli in 1879 are not accepted at the present day as the cause of malaria.

¹ Loc. cit.

² Loc. cit.

³ Loc. cit., p. 67.

THE CORTICAL LOCALIZATION OF SIGHT AND HEARING.

REPORT OF A CASE OF BLINDNESS (SLIGHT LIGHT-PERCEPTION REMAINING) AND DEAFNESS DUE TO CEREBRAL LESIONS.

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THE two methods of determining cerebral localization are: First, the study of the effects of irritation and destruction of the cortex in animals; and, second, the study of those cases in man where localized areas have been destroyed by disease processes.

Schäfer,¹ experimenting on monkeys, has found that electrical irritation of the whole of the cortex of the occipital lobe, including its mesial and under surfaces, produces conjugate deviation of the eyes to the opposite side. These movements are looked upon by most experimenters as the expression of subjective visual sensations, and it seems that the regions from which they can be obtained are related to the sense of sight. Schäfer obtained similar results from stimulation of the posterior limb of the angular gyrus and the mesial surface immediately in front of the parieto-occipital fissure. The movements vary as different areas are irritated, and Schäfer interprets them as indicating a certain connection between parts of the cerebral visual area and of the retinae, summarizing these connections as follows:

The whole of the visual area of one hemisphere is connected with the corresponding lateral half of both retinae; the upper zone of the visual area with the upper part; the lower zone with the lower part, and the intermediate zone with the middle part.

Ferrier² found that electrical irritation of the angular gyrus caused conjugate deviation of the eyes, and occasionally of the head, to the opposite side, with upward deviation when the anterior and downward deviation when the posterior limbs respectively were irritated. He also obtained similar movements on irritation of the various parts of the occipital lobe. He could find no definite relations of certain parts of the visual cortical area to the parts of the retinae.

Schäfer³ found that extirpation or destruction of one occipital lobe produced permanent hemiopia; and that extirpation or destruction of both occipital lobes produced permanent blindness. He further found that decortication of one or both angular gyri "is not necessarily followed by any visual defect perceptible to our means of investigation in animals; but complete eradication of the gyrus produces temporary hemiopia." This he considers as being due to the mechanical insult to, and the pressure of the blood clot on, the corona radiata as they

pass under the angular gyrus. Schäfer does not believe that the angular gyrus has any particular connection with central vision. On the other hand, he has obtained marked defect of central vision from injury to both mesial surfaces of the occipital lobe.

Ferrier⁴ destroyed the surface of the occipital lobes and even severed them with the galvanocautery and scooped them out bodily, yet within a few hours the animals gave evidence of being able to see. He found, however, that destruction of the angular gyrus caused total loss of vision of temporary duration in the opposite eye; whereas, destruction of both angular gyri caused temporary total blindness, which later gave way to a peculiar permanent defect, which he considered as being due to loss of central vision. In conclusion, he states: "I do not, however, argue, as I at first believed, that the occipital lobes do not form part of the visual centres, but conclude from the facts that greater relative disturbances of vision occur from lesions of the angular gyri than from much more extensive lesions of the occipital lobes."

Von Monakow⁵ believes that the fibres from the macula lutea are in conduction relation with all the cells of each lateral geniculate body. From this anatomical relation each macula would be connected with the whole of the occipital lobe and angular gyrus. If such relations existed, the whole of the optic radiations would have to be destroyed in order to destroy central vision.

Barker⁶ states that "the macular field corresponds to the whole length of the cortical area corresponding to the calcarine fissure, and that involvement of the whole of this area is necessary to cause defect of the visual field corresponding to the fixation point."

Förster and Sachs⁷ have reported a case in which there was sudden loss of the right half of both visual fields, with exception of from one to two degrees near the fixation point. Five years later hemianopsia, involving the left halves of the visual field, set in. With the double hemianopsia central vision was retained. The acuteness of vision had decreased one-half. The power of distinguishing colors was lost, and there was inability to recognize the reciprocal position in space. Nine years after the first attack the patient died. On sectioning the brain it was found that, with the exception of a small portion of the cuneus anteriorly, and the most posterior part of the calcarine fissure, the whole mesial surface of both occipital lobes and adjacent white matters were destroyed. This case would tend to show that macular representation extended beyond the mesial surfaces of the occipital lobes, unless the small portions of cortex above mentioned were sufficient for central vision.

Henschen⁸ has reported twenty-three cases of lesions of the mesial aspect of the occipital lobes which were associated with hemianopsia, and often with some degree of hemiplegia and hemianæsthesia. Fer-

rier, commenting on these cases, says that in six at least the optic radiations were also involved.

Vialet⁹ has reported three cases of hemianopsia associated with cortical lesions. The first was one of softening, involving the internal perpendicular fissure, and extending into the calcarine fissure, with atrophy of the cuneus. The second was one of destruction of the cuneus extending to the calcarine fissure, and affecting somewhat the white substance of the lingual lobules. The third was one of softening of the inferior parietal, lingual, and fusiform lobules, together with the cuneus and apex of the occipital lobe. This patient had hemianopsia associated with word blindness.

Ferrier believes that in most cases of involvement of the mesial surfaces that the lesion extends deeply and involves the optic radiations and the posterior part of the internal capsule.

Gordinier, in his text-book, states that "in 1884 Starr was able to collect twenty-seven cases of lesion of the occipital lobe, and to definitely locate the visual area in that lobe." He also adds that "the cases reported by Seguin, Hun, Monakow, Dejerine and Henschen all show that lesions of that part of the mesial surface of the occipital and adjacent part of the temporal lobe bordering on the calcarine fissure are invariably attended by partial or complete bilateral homonymous hemianopsia. . . . Hence, this area may be termed the half-vision centre."

Contrary to the foregoing statements, there are many cases in the literature where extensive lesions of the occipital lobes have been latent—*e. g.*, Gowers¹⁰ reported a case of tumor involving the first and second occipital convolutions, the superior and inferior parietal convolutions, together with the cuneus and one-half of the precuneus, in which careful examinations failed to show any hemianopsia. Brill¹¹ reported a case in which thrombotic softening of the mesial part of the left occipital lobe, together with softening of the cortex of the lingual gyrus, the cuneus, and the cortex bordering the calcarine fissure was associated with diplopia and color-blindness for green. No defect in the visual field was discovered. Many similar cases could be quoted from the literature.

Chauffard¹² has reported a case in which lesion of the left angular and supermarginal gyri was associated with word-blindness and deafness; and Henschen¹³ has also reported a case where softening of the left angular gyrus was associated with word-blindness. Ferrier, in his article on "Cerebral Localization," in Allbutt's *System*, states that the only constant symptom in connection with lesions of the inferior parietal lobule is the association of word-blindness with lesions of the left angular gyrus.

Considering the cortical centres for hearing, Ferrier¹⁴ found that on stimulating the upper two-thirds of the superior temporal convolution

in monkeys that there resulted a quick retraction or pricking of the opposite ear, frequently accompanied by turning of the head and eyes to that side. These movements are considered by him to be "precisely those which an animal makes when a shrill sound is made toward one side." Ferrier found that destruction of the superior temporal convolution, either unilaterally or bilaterally, resulted in involvement of hearing, but that destruction of other portions of the temporal lobe were negative so far as affecting hearing.

Schäfer¹⁵ and Brown were not able to confirm these results. In six cases they more or less completely destroyed the superior temporal convolution on both sides, and in one case scooped it out entirely. They found that deafness did not ensue, and in fact that no permanent involvement of hearing resulted, so far as it was possible to determine in monkeys.

Shaw¹⁶ has reported a case of sudden apoplectic seizures, resulting loss of speech and deafness. The illness lasted one year, and at autopsy there was complete atrophy of the angular gyri and the superior temporal convolutions on both sides.

Mills¹⁷ has reported a case of a woman who had an apoplectic attack which left her unable to understand spoken language, but able to hear other sounds. Six years later she suffered another attack, which left her totally deaf. At autopsy, on the left side the posterior two-thirds of the superior temporal convolution was found greatly atrophic, together with a cavity, the remains of an old embolic softening, occupying the posterior fourth of the second temporal convolution. In the right side there was found an old hemorrhagic cyst, destroying the first and second temporal convolutions, the insula and internal capsule. Mills draws, among others, the following conclusions: 1. The centre for word-hearing is situated in the hinder thirds of the first and second temporal convolutions, possibly it is restricted to the second temporal. . . . 3. A lesion confined to the posterior thirds of the first and second temporal convolutions of the left hemisphere will produce complete or almost complete word-deafness, the corresponding regions of the other hemisphere remaining intact. 4. The field or sphere for all auditory memories covers a much larger cortical area than that for word-hearing, including at least the posterior thirds of the first and second temporal convolutions.

Kaufman¹⁸ has reported a case of softening of the first and second temporal convolutions and atrophy of the lower part of the postcentral and supermarginal gyri—there were left hemiplegia and total deafness in the left ear. Ferguson¹⁹ reports a case in which convulsive movements occurred on the left side for two years previous to death. These were accompanied by an auditory aura and later by total deafness in the left ear. At autopsy a tumor destroying the superior temporal

completely and the inferior temporal partially was found on the right side.

Ferrier, in his article on "Cerebral Localization," in Allbutt's *System*, states that lesions of the temporal lobe may be entirely latent. He also states that irritative lesions of the temporal lobe cause auditory aura, whether the lesions be on the right or on the left side. Gowers, in his *Diseases of the Nervous System*, gives two cases, in one of which a tumor beneath the superior temporal convolution caused convulsions beginning with an auditory aura; in the other a tumor affecting the superior temporal convolution caused unilateral convulsions preceded by a loud noise as of machinery.

Gordinier, in his *Anatomy of the Nervous System*, states that "in man the centres of audition are located in the same parts of the temporal lobes as Ferrier has located them in the monkey"—superior temporal convolutions.

To review briefly the nervous mechanisms of sight and hearing, it will be remembered that the optic nerve is not a peripheral nerve, and that the retina is an outgrowth of the brain. The cells of the inner nuclear layer of the retina are the visual sensory cells, and their axones end around cells in the inner molecular layer. The axones of these latter cells go to form the optic nerve. Part of these fibres cross in the optic commissure and part do not; those that come from the nasal half of each eye cross, while those arising from the temporal half of each eye do not cross. The two bundles of fibres leaving the commissure are known as the optic tracts. Each of these, after winding around the crura, divide into two roots, a lateral and a mesial. The fibres of the lateral root end around cells in either the lateral geniculate body, the pulvinar of the optic thalamus, or the superior corpora quadrigemina. Fibres from the cells of these three ganglia pass through the posterior tip of the internal capsule and radiate to the occipital lobe, the angular gyrus and perhaps the neighboring regions. These latter fibres are known as the optic radiations. The fibres of the mesial root of the optic tract pass to the internal geniculate body, and have no connection either with the retina or the optic centres.

The cell bodies of the peripheral auditory neurons are situated in the ganglion spirale, their dendrites being distributed to Corti's organ, their axones passing through the cochlear root of the acoustic nerve to end around cells in the ventral and dorsal cochlear nuclei in the medulla. The fibres from the cells of these nuclei pass by way of both the striæ medullares and the corpus trapezoidum to terminate around cells in the superior olivary nucleus, the nuclei of the corpus trapezoidum and the inferior corpora quadrigemina; while others pass on through the lateral lemniscus to the internal geniculate body. Fibres from the cells of the inferior corpora quadrigemina and the internal

geniculate pass by way of the posterior tip of the internal capsule to radiate to the temporal lobe—the fibres being known as the auditory radiations.

I will now describe the case of M. E., admitted into the Northern Michigan Asylum in 1892. She was a native of New York, of Irish descent, married, fifty-five years old, and the mother of four children, the youngest being fifteen years of age. One brother of the patient was insane. The history which accompanied the patient states that about seventeen years before her admission she had fits at night. These occurred nearly every night, and lasted for a period of about two years. Since that time they have not been noticed. No description of the fits is given. About three years previous to her admission she became depressed, irritable, and at times restless. Then there followed a period of about six months during which she slept the greater part of the time. At about this time she suffered several strokes of paralysis on the right side and one on the left side. Following these attacks she became blind and deaf. She became uncleanly in habits, noisy and destructive, and at times would violently pull her hair.

The results of the examination given her at the time of her admission are as follows: Height five feet four inches, weight 132 pounds. Appearance neglected. Temperature 98.4° F. Pulse 90 and very irregular, both in force and rhythm. Arteries quite extensively atheromatous. Mitral systolic murmur. She is practically blind, though she is able to tell the presence of a bright light. The pupils are equal and react to light. She is also deaf. The sense of smell is very keen. The speech is drawling, and the gait lame. She is slightly paretic in all limbs. Cutaneous sensibility is normal so far as can be determined. The mental action is slow and incoherent. Memory *nil*. She seems to hear her husband and daughter talking to her, and she talks back to them, using endearing terms.

From the time of her admission she had to be fed. She remained noisy a large part of the time, talking in a loud tone of voice with various members of her family. She was untidy in her habits day and night. She appeared to recognize her blindness, but not her deafness. Her appetite was voracious. At times she used obscene and profane language.

Beginning in April, 1892, and lasting throughout her illness, she suffered from seizures at irregular intervals. While these were not exactly the same, they resembled one another in many particulars. The following is a description of one of these seizures: The attack began on the right side. The muscles of the mouth twitched, the sternocleidomastoid contracted; this was followed by contractions in the arm, and then in the leg. Then the contractions appeared in the left arm, which were followed by contractions in the left leg. The eyes were turned toward the right. After the convulsive movements had ceased in other parts the right leg kept up a constant jerking. The breathing was labored, and finally there was a spasm of the diaphragm, following which she became comatose. In the course of a few hours she appeared as well as usual. Not all but by far the greater number of the seizures began on the right side.

The seizures became more frequent in number, and the patient became correspondingly weaker, and she finally died of exhaustion in Novem-

ber, 1893. Up to within a few days of her death she was able to get out of bed unaided.

Unfortunately, the notes of the autopsy were lost, so I will proceed at once to the description of the brain. A cut was made through the corpus callosum, pons, medulla, etc., exactly in the median line, thus

FIG. 1.

FIG. 2.

separating the two hemispheres and leaving the medulla, pons, and crus connected with their respective hemisphere. The brain was hardened at first in Müller's fluid, and afterward transferred to alcohol. The description which follows was made from the brain after it was hardened.

On examining the left hemisphere a large cyst is to be seen opening at the apex of the occipital lobe, and communicating directly with the lateral ventricle by an opening easily admitting the thumb. The lateral

ventricle is greatly dilated. The cyst was filled with a clear straw-colored fluid resembling the normal cerebro-spinal fluid, and is undoubtedly the remains of an old embolic softening caused by a plugging of the posterior cerebral artery.

A careful examination of the hemisphere shows that on the mesial surface the cuneus, lingual and fusiform gyri are totally destroyed, while the inferior temporal and posterior part of the precuneus are atrophic; on the convex surface the occipital lobe is wholly destroyed, together with the greater portion of the angular gyrus, while the superior temporal, the posterior part of the middle temporal, and the posterior parts of the parietal gyri are atrophic. Particularly is this atrophy marked in the superior temporal gyrus, which, when compared with the corresponding gyrus on the opposite side, is seen to be smaller by fully one-half. The convolutions over the whole hemisphere are probably somewhat atrophic, and the fissures wide and gaping. The extent of the lesion, as well as that of the right hemisphere, is well shown in the accompanying photographs. (Figs. 1 and 2.)

On sectioning the hemisphere it was quite plain that the whole of the occipital lobe and the angular gyrus had been entirely cut off from their connections with other parts of the brain; and, although the distortion made it hard to judge accurately, it is quite probable that the optic and auditory radiations were entirely destroyed.

On examining the right hemisphere one finds a deep and gaping fissure extending transversely and occupying the region of the superior occipital convolution. On closer examination it is seen that all that exists between the exterior and the posterior horn of the lateral ventricle is a thin semi-transparent membrane. On the mesial surface the cuneus, together with the greater part of the lingual and fusiform gyri, have been destroyed, and the portions of the latter that remain are shrivelled and atrophic. The posterior part of the precuneus is also atrophic. On the convex surface the superior and middle occipital gyri are wholly destroyed, while the inferior occipital, the angular, and the supermarginal gyri are markedly atrophic. On sectioning the hemisphere the cyst was found to extend back under the part of the occipital lobe, which looked from the exterior as though it was fairly well preserved; in fact, after a careful dissection of the region, I was well satisfied that no part of the occipital lobe on either its mesial or convex surface could have any remaining connections with other parts of the brain. The parts anterior to the lesion still retained their connections. This destruction of brain substance is again the result of plugging of the posterior cerebral artery.

The vessels of the brain are markedly atheromatous, particularly the branches of the posterior cerebral artery that remained open. The walls of the arteries are thick and hard, and their lumen greatly diminished.

The following parts of the brain were subjected to a careful microscopical examination: The cortex of the temporal convolutions and such parts of the right occipital and angular gyri as remained; the posterior limb of the internal capsule; the geniculate ganglia and the corpora quadrigemina; the optic tracts and the optic nerves; the pons and medulla, and the acoustic nerves. Hæmatoxylin, Van Gieson's, and Weigert's stains were used.

Microscopically, the walls of the cerebral vessels are much thickened

and their lumen correspondingly decreased. In many of the vessels the thickening is symmetrical, but in others there are distinct nodular projections into the lumen, some of which can be seen with the naked eye. These nodules are made up of quite deeply stained, elongated cells, which have resulted from a proliferation of the subendothelial part of the intima. In many places this tissue has undergone a hyaline change, and in these places the nuclei are much fewer in number; in other places the cells have undergone a fatty change, which, dissolved out, leaves quite large, clear spaces; in still other nodules there is a marked infiltration with small round cells.

Those parts of the left occipital lobe that remained were carefully studied with reference to the question, whether they were still in connection with the lower parts of the brain. I found universally that the fibres had been destroyed, that the ganglion cells were either entirely gone or atrophic, and that there was intense infiltration with round cells. Various sections of the right angular gyrus proved beyond doubt that this part of the brain had no remaining connections with other parts. The nerve cells and their fibres were completely degenerated. The right angular gyrus, though atrophic, was in a much better condition, and certainly many of its fibres still stained well with Weigert's stain. The left superior temporal convolution was found markedly atrophic, and when compared with the corresponding convolution on the opposite side the ganglion cells were decreased, and the number of small cells with a round, deeply-staining nucleus was much increased.

The study of the internal capsule was rendered difficult from the distortion of the parts. With Weigert's stain degeneration in the posterior tip could be demonstrated, but the exact extent of this degeneration I was unable to determine.

The left internal and external geniculate bodies showed very marked changes. With Weigert's stain the number of medullated fibres entering the ganglia was small indeed. The cells, particularly the large ganglion cells, were degenerated. There were numerous spaces left by the disappearance of these cells. The cells that remained were loaded with large, yellow, high refractive pigment granules. In many the nucleus had disappeared, and in others it was pushed off to the edge of the cell and stained poorly. On comparing the geniculate ganglia on the left with those on the right, I found that the internal geniculate ganglion on each side had suffered to about the same extent, but that the right external geniculate was much better preserved than the left. The number of medullated fibres was greater, the ganglion cells were more numerous, only a few contained pigment, and the cells stained much better.

The cells in the corpora quadrigemina showed degenerative changes similar to those described in the geniculate ganglia. These changes were again most notable in the large ganglion cells. The ganglia were equally affected on the two sides.

Weigert's stain showed an extensive degeneration in the left optic tract. While not all the fibres have disappeared, the number remaining is small, except one bundle, which seems fairly well preserved. This bundle is situated externally and to one side, and is probably the inferior commissure Guddeni. While a good many of the fibres of the right optic tract have disappeared, the number remaining is much greater than upon the left. It is the peripheral parts of the tract that

show the most marked degeneration, while in the central part the fibres are much more numerous.

The great majority of the fibres of the left optic nerve have disappeared. Throughout the whole nerve there are scattered fibres remaining, but in the central part they are much more numerous. This is quite noticeable, and is the first thing to be noticed in examining the specimen. The connective tissue is very greatly increased throughout the whole nerve, the septa being large and numerous. The right optic nerve is better preserved than the left. The number of fibres is reduced throughout the whole nerve, but much more so on one side than on the other. On the side corresponding to the lessened number of nerve fibres the connective tissue is again increased. This area of more marked degeneration occupies less than one-half of the optic nerve. These descriptions are made from a section just in front of the commissure.

I could not demonstrate any degenerative changes in the pons, medulla, or in the acoustic nerve.

From a careful study of the brain, both macroscopically and microscopically, I am convinced that the only part of the cortex, to which is ascribed connection with vision, that remained in connection with the lower centres was the right angular gyrus. Hence, this must have sufficed for the perception of light which the patient possessed.

Henschen²⁰ has made a careful examination of the pathology of a number of cases of brain lesions, and from an analysis of these has been able to localize bundles from various parts of the eye in definite regions of the optic nerve and tract. In a section just anterior to the chiasm he pictures the crucial fibres as occupying the mesial side, the non-crucial fibres as occupying the lateral side, and the macular fibres the central region. In the optic tract the macular fibres still run in the central region. Von Monakow also pictures the macular fibres as running in the central part of the optic nerve and tract. Granting this localization of the macular fibres as correct, it will be remembered that the central part of the left optic nerve in this case was the only part which contained nerve fibres in any number, and that the central part of the opposite tract contained a goodly number of fibres which stained well in Weigert's, and as the only part of the visual area still connected with the lower brain centres was the right angular gyrus, this would show a connection of the macular region with the opposite angular gyrus. It will also be remembered that not only was the right optic tract better preserved than the left, but that the right external geniculate was also in a better condition than the left. This is undoubtedly due to the fact that part of the right visual area (angular gyrus) still remained, and that the sense of light-perception was transmitted through the right visual paths.

The explanation of the deafness I believe to be the involvement of the auditory radiations, although the more extensive involvement on the left side, with the atrophy of the superior temporal convolution,

calls to mind the possibility of a left-sided lesion causing deafness in individual cases.

CONCLUSIONS. 1. Destruction of the cortical visual areas will lead to a degeneration of the cells in the geniculate ganglia and the corpora quadrigemina, and to a degeneration of the nerve fibres of the optic tracts and nerves.

2. The macula lutea of one eye is in connection with the opposite angular gyrus.

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THE LEUCOCYTE COUNT IN SEROUS PLEURISY.

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DURING my last two services at the Boston City Hospital I have had a leucocyte count made daily, from entrance until discharge or the disappearance of the fluid, in twenty cases of serous pleurisy. The cases were all primary—that is, not secondary to any acute pulmonary disease. I wish here to acknowledge my indebtedness to my house officers, Drs. Hazen, Holt, and Smith, for their patient and careful work in making the counts. The object of the investigation was two-fold: to determine if there was anything in the white count characteristic enough to be of value in the diagnosis from other pulmonary diseases, and if it furnished any information as to the amount of progress of the exudation.

Two hundred and twenty-four counts were made, with the following results:

3,000 to 4,000	.	.	.	.	.	.	2
4,000 to 5,000	.	.	.	.	.	.	19
5,000 to 6,000	.	.	.	.	.	.	40
6,000 to 7,000	.	.	.	.	.	.	31
7,000 to 8,000	.	.	.	.	.	.	50
8,000 to 9,000	.	.	.	.	.	.	42
9,000 to 10,000	.	.	.	.	.	.	27
10,000 to 11,000	.	.	.	.	.	.	8
11,000 to 12,000	.	.	.	.	.	.	4
13,000 to 14,000	.	.	.	.	.	.	1
							<hr/> 224

That is, accepting 10,000 as the maximum normal number of white cells, only thirteen counts showed an increase in their number above the normal. Nine of these were in one case, which, on autopsy, showed a secondary pneumococcus infection. The other four occurred irregularly in two cases: 10,800 and 11,700 in one and 10,400 and 10,200 in another—figures but little above the normal. These results correspond to those of Cabot, who in single counts in ninety-nine cases found an average of 6130; twenty-three, however, were above 10,000. The results of other observers are somewhat at variance. The conclusion seems justified, however, that primary serous pleurisy does not show a leucocytosis.

INFLUENCE OF ETIOLOGY. Two of the cases were proved to be tubercular by autopsy. One of these was the case with secondary pneumococcus infection and intermittent leucocytosis. Tubercle bacilli were found in the sputum of three others. Another showed the physical signs of tuberculosis in the other lung, and three more had a characteristic history of tuberculosis—that is, nine were almost certainly tubercular. In no one of these, except the case of pneumococcus infection, was the count ever above 10,000.

There was no tubercular history or physical signs of tuberculosis elsewhere in the other eleven. The sputum contained no tubercle bacilli on repeated examinations in four. It was not examined in the others. The fluid was examined in seven of these eleven cases, and showed no organisms, either in smears or cultures. It was also sterile in the six tubercular cases in which it was examined. No experiments were made on animals. Judging from the results obtained by injection into animals of the fluid of serous pleurisy, the presumption is, however, that these cases were also tubercular.

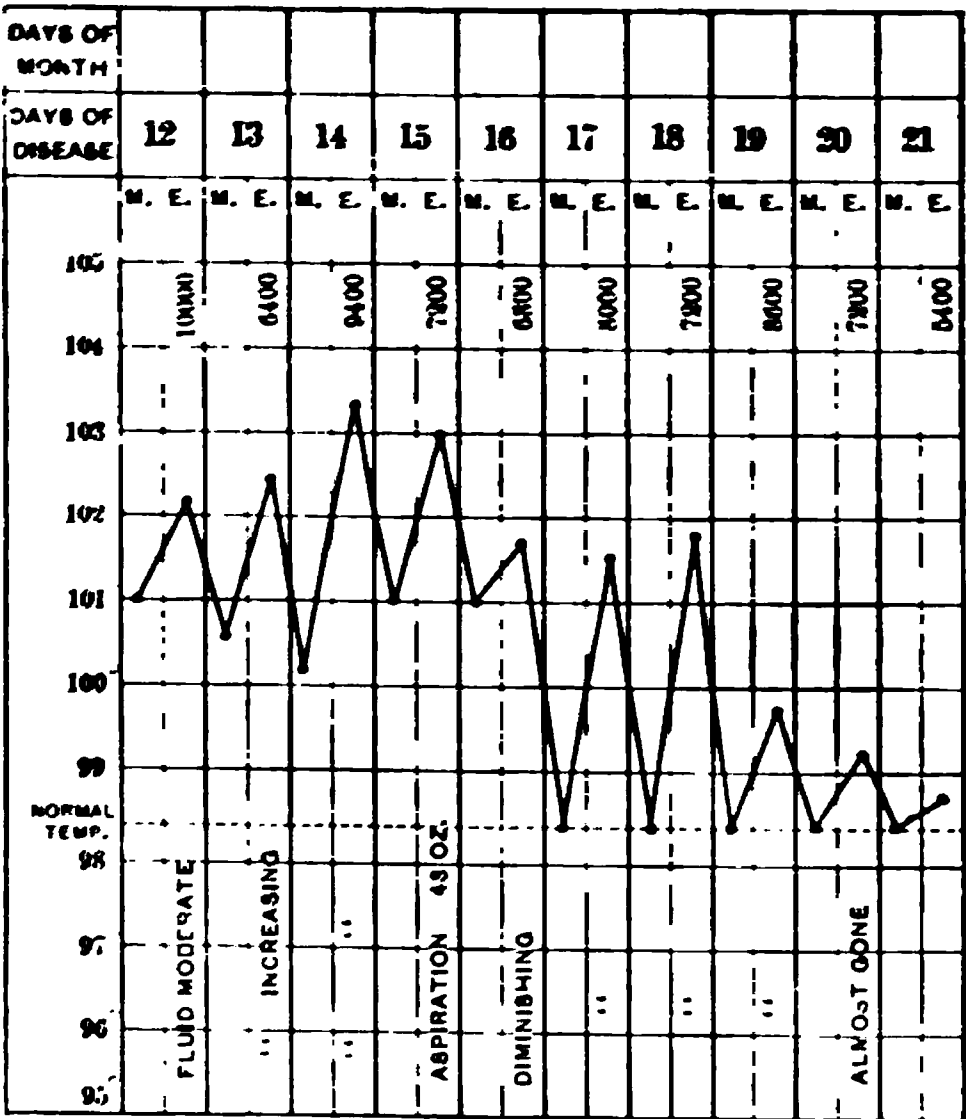
There was an intermittent leucocytosis in the case in which there was a secondary pneumococcus infection.

It seems evident, therefore, that tubercular serous pleurisy does not show a leucocytosis. It is possible that serous pleurisy of other origin may show it. This must be an unusual occurrence, however, as primary serous pleurisy is almost always tubercular.

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RELATION OF THE WHITE COUNT TO THE DURATION OF THE ILLNESS. No case was seen before fluid was present. One case was seen five days and another seven days after the onset of symptoms. The white counts in these cases were 4800 and 6800 respectively. The counts in two cases at the end of seven and eight weeks were 5800 and 6000. No relation whatever was evident between the number of leucocytes and the duration of the disease.

RELATION TO THE TEMPERATURE. There was no connection evident between the presence, absence, or degree of fever. The lowest counts were sometimes seen with the highest temperatures, and *vice versa*. The leucocytes did not rise or fall with the rise or fall of the temperatures. The number of white cells and the temperature were evidently completely independent of each other.



RELATION TO THE CHARACTER OF THE FLUID. The fluid from the case of pneumococcus infection was bloody and microscopically contained numerous pus-corpuscles. As already noted, this case presented an intermittent leucocytosis. The fluid was bloody in another case, and microscopically showed numerous pus-corpuscles in two others. None of these, however, at any time showed any leucocytosis. The presence of blood and microscopical pus in the fluid has, therefore, no effect on the number of white cells.

RELATION TO THE AMOUNT OF FLUID. There was no relation apparent between the amount of fluid and the number of white corpuscles. For example, just before the aspiration of 100 ounces in one case the white count was 7100, and before the aspiration of 8 ounces in

another, 8000. In another case, where 52 ounces were obtained, it was 8700, and in another, where only 10 ounces could be withdrawn, 5200.

RELATION TO THE INCREASE AND DIMINUTION IN THE AMOUNT OF FLUID. The amount of fluid increased under observation in six cases, diminished in seventeen cases, and remained stationary in five. Both increase and decrease took place while under observation in six cases. Nevertheless, no relation whatever could be made out between the increase or diminution of the fluid and the number of white cells, the white count dodging up and down without the slightest apparent connection with the quantity of fluid. This is well shown by the accompanying chart.

CONCLUSIONS. Serous pleurisy is only exceptionally accompanied by an increase in the number of white corpuscles, and then intermittently. The white count is of value in two ways in the diagnosis of serous pleurisy: If the physical signs are doubtful and there is no leucocytosis the condition is almost certainly not pneumonia or empyema, but serous pleurisy. If there is a serous pleurisy and a continuous leucocytosis, some complication is present. The white count in serous pleurisy affords no information as to the duration of the process, the amount of the fluid, and its increase or diminution. The number of white cells is not influenced by the presence of blood or microscopical pus in the fluid or by the degree of fever.

THE OPERATIVE TREATMENT OF CIRRHOSIS OF THE LIVER.

REPORT OF A SUCCESSFUL CASE.

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HISTORICAL. Though the operation for the relief of ascites due to cirrhosis of the liver was suggested some years ago, it is only recently that it seems to have attracted the attention it deserves, and to Mr. Rutherford Morison belongs the credit of having brought the first case to a successful issue. The operation had been performed on several occasions before, however. In 1889, Von der Meule performed a similar operation, but his patient died almost immediately of shock; Schelky followed in 1891, and his case also terminated fatally, death being due to peritonitis; finally, in 1892, Lens, of Holland, reported a case in which he sutured the edge of the omentum to the wound, but without affording the patient any relief; the patient died six months later, during which time it was necessary on four occasions to resort to paracentesis. Morison's first case was equally unsuccessful, but in his second he obtained results which substantiated the claims made on behalf of this rather novel procedure. Whereas prior to the operation his patient had to be tapped frequently, she lived for two years without any re-

accumulation of fluid, death having been due to an operation for a ventral hernia which had developed at the site of the cicatrix. At the autopsy the entire contents of the abdomen were removed *en masse* and the vessels of the portal system injected. The liver, spleen, and the omentum were adherent to the parietal peritoneum by strong bands of fibrous tissue; the liver was atrophic and had undergone fatty degeneration; the spleen was four times its natural size.

Since October 22, 1895, the date of Morison's second operation, nine others have been recorded, making, with the previous five, a sum total of fourteen cases. Some of these are of more than usual interest, particularly the case operated upon by Talma. The patient was a boy, some nine years of age, who had acute parenchymatous nephritis, together with enlargement of the liver and spleen of unknown origin. The nephritis responded satisfactorily to appropriate treatment, and the anasarca disappeared. The ascites persisted, however, and an exploratory laparotomy was advised, with the expectation of finding some lesion of the peritoneum. The latter proved to be normal, and the wound was closed. The condition of the kidneys continued to improve all the while, but the ascites persisted, despite frequent tapping. Accordingly, a second laparotomy, at which the omentum was sutured to the wound, was performed. The results were perfect; there was no recurrence of the ascites; but inasmuch as there was no diminution in the size of the spleen, Talma operated again—for the third time—and stitched the lower edge of the spleen in an artificially made pocket between the peritoneum and muscles of the abdominal wall. The operation was in every way a success; at the last observation, some two years afterward, the patient was apparently perfectly well. The urine was normal; there was no sign of ascites and no jaundice; the spleen and liver, though still enlarged, were much smaller.

The author's patient was a laborer of middle life, who was admitted into the medical ward of the University Hospital, May 10, 1900. He had contracted syphilis in 1882, and had always been a free user of alcohol and tobacco. His heart was enlarged, and a systolic murmur was plainly audible over the whole præcordia. The lungs were normal. Both the spleen and liver were enlarged; the upper margin of the liver was on a level with the fifth rib, and the lower border could be plainly felt below the costal margin. The abdomen was greatly distended with ascitic fluid, and the lower extremities were cedematous. The urine was of an amber color, cloudy, reaction acid, specific gravity 1019; it contained a trace of albumin and a few pus and blood-cells, but no casts. The administration of digitalis, theobromine, caffeine, diuretin, urea, strophanthus, and other diuretics had no appreciable effect upon the ascites. Paracentesis was resorted to on May 30th, and repeated four times, at intervals of about two weeks, on which occasions 512, 485, 330, and 400 fluidounces respectively were withdrawn. The case was regarded as a rather hopeless one, and at my suggestion the patient was transferred to the surgical ward.

Operation, July 25, 1900. It was my intention to perform the operation under local anæsthesia, but after opening the peritoneal cavity the manipulation elicited so much pain that it was necessary to finish the operation under ether narcosis. The parietal peritoneum of the abdominal wall on either side of the incision was rubbed quite vigorously with a gauze pad, and the omentum, which was very much thickened and contracted, sutured to the parietal peritoneum and to the margins of the wound. The fluid contents of the abdominal cavity were evacuated and the incision closed without drainage. Convalescence was uninterrupted; the patient suffered no ill effects from the operation. The wound healed throughout per primam. The history subsequent to the operation, since which three months have elapsed, is briefly as follows: The patient has been tapped twice, once on the thirteenth day, 328 fluidounces having been withdrawn, and again on the thirty-sixth day, on which occasion only 96 ounces were withdrawn. From that time to the present writing there has been absolutely no reaccumulation of fluid; the patient has gained rapidly in strength; he is no longer bed-ridden, goes out daily, and receives no medication other than enough citrate of magnesia to insure a daily evacuation of the bowel.

REMARKS. This operation purports to open another channel for the relief of the obstructed portal circulation. I say another channel, because there already exists a more or less free collateral circulation between the systems of the portal vein and the inferior vena cava. Thus the coronaries anastomose, through the œsophageal plexus, with the azygos veins; the veins of the cæcum and colon with the internal mammary; the hypogastric with the hemorrhoidal; the veins of the hepatic ligament with those in Glisson's capsule; the veins of the round ligament with the epigastric. By inciting the formation of adhesions between the omentum and the abdominal wall and between the surfaces of the liver and spleen and that of the diaphragm this operation furnishes an additional outlet for blood of the obstructed portal system. The examination of specimens obtained at the autopsy table prove beyond a doubt that the operation as conducted accomplishes this purpose. Thus in the case operated upon by Lens, venous channels were easily demonstrable in the adhesions that had formed between omentum and peritoneum. The technique of the operation is very simple. The operation should be performed preferably under local anæsthesia, as individuals afflicted with cirrhosis of the liver are usually alcoholics and belong to a class in which ether narcosis of itself has a very material effect upon the mortality. An incision three or four inches in length is made in the median line, or in the border of the rectus, above the umbilicus. The peritoneum of the adjacent surfaces of the diaphragm, liver, and spleen, respectively, and the peritoneum on either side of the wound are scarified with a blunt curette or rubbed with a gauze pad. The latter is the better procedure, as it will give rise to less bleeding, at the same time exciting a peritonitis sufficient to insure adhesion between the apposed surfaces. The omentum is sutured to the parietal peritoneum for a distance of three or four

inches on either side of the wound and to the margins of the wound itself. The evacuation of the fluid completes the operation, the wound being closed without drainage. In a number of the recorded cases tubular drainage was inserted through a suprapubic opening and removed about the fourteenth day. This step of the operation, I believe, should be omitted; it can have no beneficial effect upon the ultimate results, while it certainly introduces an additional element of risk, as in Weir's case, which died of purulent peritonitis, the tract of the drainage-tube furnishing the avenue of infection. It may be necessary, if drainage is not introduced, as in the author's case, to tap the patient on one or more occasions during the time the adhesions and venous channels are in process of formation. The dressing is secured in place by broad strips of adhesive plaster, which are applied with the object of keeping in apposition the scarified surfaces of the liver, spleen, and diaphragm.

The chief indication for the operation is the presence of ascites due to obstruction of the veins of the portal system, when the obstruction itself is due to cirrhosis of the liver. It should be borne in mind, however, that the operation is not indicated in every case of hepatic cirrhosis with ascites; the operation is absolutely dependent for its success upon the retained function of the liver cells. In other words, the absence of functional activity is an absolute contraindication. It has been suggested that the presence of cardiac or renal disease should constitute a contraindication, but this might be regarded rather as a relative than as an absolute one.

Apart from the risks attending any operative procedure upon patients with chronic visceral disease, there are certain well-recognized dangers peculiar to this operation. These have been proven by the experiments of Eck, Hahn, and Tilmann, who called attention to the serious consequences attending the entrance of the blood from the mesenteric veins directly into the general circulation. When Tilmann ligated the portal or mesenteric veins the animals died; when, however, he waited until he had established a collateral circulation by an operation similar to that above described, he found he could gradually cut off the venous blood going to the liver without such disastrous results. Hahn observed a number of nervous phenomena exhibited by dogs in which he had established a free anastomosis between the vena cava and porta. These nervous phenomena, which were nothing more nor less than evidences of auto-intoxication, were observed in the third case of Morison's series. The patient recovered from the operation, but for at least ten months he exhibited certain nervous symptoms; they subsequently disappeared. Apart from demonstrating experimentally the dangers and origin of these nervous complications, the experiments of Hahn, Eck, and Tilmann emphasize the necessity, as has been pointed out by Weir, of bringing about this collateral anastomosis gradually, so as to use the intravening capillary circulation as an assimilator, and thus avoid fatal toxæmia.

TABLE I.

No.	Operator.	Sex.	Age.	Conditions found at operation.	Result.		Remarks.
					Immediate.	Ultimate.	
1	Drummond and Morison.	Female.	48	Liver enlarged; surface smooth.	Recovery.	Death 19 months.	Required frequent tapping.
2	Drummond and Morison.	Female.	35	.....	Recovery.	Recovery.	Perfectly well after lapse of two years.
3	Morison.	Male.	42	Liver cirrhotic; spleen enlarged.	Recovery.	Recovery.	Suffered from nervous phenomena, result of intestinal intoxication.
4	Morison.	Male.	54	Cirrhotic liver; splenic tumor.	Death 11th day.	.....	Patient died supposedly from contracted kidneys.
5	Ewart.	.....	...	Liver not cirrhotic.	Recovery.	Death severe.	Operation had no effect upon ascites.
6	Scheiky.	.....	...	.....	Death 14th day.	.....	Patient died of delirium tremens.
7	Lena.	Male.	61	Atrophic liver.	Recovery.	Death 5 months.	Failure of operation attributed to atrophic condition of liver.
8	Talma.	Male.	9	Liver enlarged; surface granular; splenic tumor; parenchymatous nephritis.	Recovery.	Recovery.	The patient was perfectly well twenty-six months after operation.
9	Neumann.	Male.	45	Splenic tumor.	Recovery.	Recovery.	Patient had no ascites six months after operation.
10	Weir.	Male.	30	Liver capsule thickened;	Death 5th day.	.....	Patient died of purulent peritonitis.
11	Rollston and Turner.	Male.	45	.....	Recovery.	Recovery.	Patient when seen four months afterward was perfectly well.
12	Rollston and Turner.	Male.	52	Liver cirrhotic.	Recovery.	Unimproved.	after operation was bed-ridden; of the legs.
13	Bosowski.	Female.	9	Liver cirrhotic.	Recovery.	Slightly improved.	as rapidly after operation.
14	Fraser.	Male.	45	Liver cirrhotic; omentum short and thickened.	Recovery.	Recovery. Tapped twice.	Three months after operation there is no evidence of reappearance of ascites.

1 Died from effects of an operation for ventral hernia.

RESULTS. The number of operations is so limited that no very definite conclusions can as yet be drawn ; when we exclude those in which there was some error in technique, those in which there was an error of diagnosis, or those in which the operation was contraindicated, the number is still smaller. Thus, for example, Case X. died of purulent peritonitis from infection through the tract of a drainage-tube ; in Cases I. and V. the liver was not cirrhotic ; in Case IV. the patient had contracted kidneys ; in Case VI. the patient developed delirium tremens, tore off the dressings, and infected the wound. These cases could very properly be excluded in estimating the value of the operation, since the bad result in each was attributable to either a mistaken diagnosis, or an avoidable or an unavoidable complication.

TABLE II.

Died within two weeks	3
“ in nineteenth month without improvement	1
“ in sixth “ “ “	1
“ in sixth (?) “ “ “	1
Living but unimproved	1
“ and slightly improved	1
Living and free from ascites at periods of 8, 4, 6, 24, 24, and 26 months respectively	6

Excluding those cases of failure for which the operation should not be held accountable the following remain :

TABLE III.

Died within two weeks	0
Living but unimproved	1
“ and improved	1
Living and free from ascites at periods of 8, 4, 6, 24, 24, and 26 months respectively	6

A comparison between these two tables would be expressed in figures as follows :

Mortality	Table I.	21 per cent.	Table II.	0
Unimproved	“ I.	28 “ “	“ II.	12.5 per cent
Improved	“ I.	8 “ “	“ II.	12.5 “ “
Recovery	“ I.	48 “ “	“ II.	75 “ “

Though our experience is as yet very limited, I believe that in properly selected cases, and by that I mean (1) cases in which the liver is cirrhotic ; (2) cases in which there is reason to believe the liver cells are not devoid of function ; (3) cases in which internal medication (particularly iodide of potassium) and paracentesis fail to afford relief—or, in other words, in utterly hopeless cases—and (4) cases in which there is no reasonable contraindication, that in such carefully selected cases the operation has a future. The cases are so hopeless, the technique so simple, the dangers so trivial, and the outlook so promising, that the prospects of this mode of treatment becoming an established one seem bright. That surgeons now have at their command a method, both

rational and reliable, of affording relief, sometimes temporary but often permanent, to intractable cases of ascites, seems to me a very fair conclusion to draw from the accumulated evidence.

REPORT OF A CASE OF EXTENSIVE DISSECTING ANEURISM OF THE AORTA.

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OF NEW YORK.

THE specimen which is the subject of this paper was presented at the May meeting of the New York Pathological Society, 1900, and it has been thought worth while reporting it more in detail, presenting, as it does, several points of considerable interest, and as a small contribution to the literature on the subject.

Unfortunately, there is no clinical history or ante-mortem examination of the patient to offer, and on this account the report is rendered less valuable from a clinical stand-point; pathologically, however, it is of interest as illustrating the possibility of the maintenance of the circulation in spite of such decided anatomical irregularities (which must have existed for a long time previous), and showing, post-mortem, so few evidences of a disturbed circulation. The autopsy, beside resulting in the finding of this aneurism, simply determined the fact that the patient died of a chronic interstitial nephritis, and is otherwise devoid of interest.

Post-mortem Notes. Man, aged eighty years, mendicant, very poorly nourished. Heart shows moderate hypertrophy of the left ventricular wall; kidneys are small, granular, cystic, and very hard; bloodvessels throughout the body are, so far as examined, dilated about one-third larger than normal size.

Examination of Aorta. The entire arch is dilated in common with the other arteries of the body. Ostia of innominate, left common carotid, and left subclavian very large. At the junction of the descending part of the arch with the thoracic aorta is seen the point of rupture, of intima, and part of media where the dissecting aneurism begins, this having taken place in the anterior wall. Here it is seen that there are two aortic tubes with a common interwall lying antero-posterior to each other, and dividing below into double common iliacs. At the point above where the dissection begins one finds three distinct openings:

1. The opening into the continuation of the true aorta, which is posterior.
2. The opening into the dissecting aneurism, anteriorly.
3. An opening which leads into a small, sacculated aneurism, 6 x 4 cm., on the left lateral aspect of the aorta, which is partially filled with laminated clot. Following the course of the aneurism, which has dissected its way along the entire aorta on its anterior aspect and along the common *iliacs*, giving double common iliacs, it is seen to termi-

nate on the right side, by a secondary opening into the right common iliac artery just before its bifurcation into external and internal iliacs, and on the left side into the left common iliac about 3 cm. from its origin.

From the beginning of the aneurism to the point at which the coeliac axis and superior mesenteric arteries are given off the aneurismal sac is dilated in a fusiform manner, giving an aneurism within an aneurism, so to speak; this part is also partially filled with laminated clot.

Noting the way in which the important vessels arise, we find that given off directly from the aneurismal sac are the left suprarenal and inferior mesenteric arteries, there being no openings into the true aortic tube to show the point from which they must have originally sprung; in other words, the origin of these vessels has been entirely lifted off the aorta.

However, in the anterior wall of the aorta, at a point corresponding very accurately with what was probably the original opening of the inferior mesenteric artery, a fibrous nodule is seen, the reverse side of which (in the true aorta) shows a depression. The impression gained is that the original opening of this vessel has been closed at this point by a fibrosis; at all events, the artery communicates only with the aneurismal sac.

The other branches are given off in the usual way, although some, particularly the left renal, show an obliterating endarteritis.

Microscopical examination shows the wall of the dissecting aneurism to consist of a media which is sclerotic and thickened, and an externa, also thickened unevenly. The entire specimen is rather stiff and hard from fibrous changes, which are shown in the coats of the aorta itself as well as in the aneurism.

Looking over the literature on the subject of dissecting aneurisms in general, it seems quite worth while to collect a few points of interest concerning this rather unusual condition as it presents itself most often, and stating the special points of interest in this case.

1. *Frequency.* In 1863, Peacock collected and tabulated eight cases.¹ In 1885, Boströni found seventeen, while in 1895, Adami reported two hundred of all kinds of dissecting aneurisms. By far the greater number of these last were the small dissecting aneurisms confined to the arch of the aorta, which terminated life by rupture; comparatively few of the larger type, and very few of the extent of this specimen.

2. *Point of Origin.* In by far the larger proportion of the reported cases the dissection began at the sinuses of Valsalva or just below the origin of the left subclavian artery.² This one, however, began considerably lower, namely, at the junction of the descending part of the aortic arch with the thoracic aorta.

3. *Position.* Although it is not possible to give figures, as in some of the cases, there is no mention made of the fact, there are more reported in which the dissection took place posteriorly,³ while in this case the aneurismal sac lay anteriorly and directly in front of the true aorta.

4. *Extent.* This varies, of course, very greatly and, as already stated, in the larger number the dissection is confined to the arch of the aorta. However, we find records of all sorts of varieties in this respect, and in Peacock's series it reached into the iliacs in three cases and as low as the popliteal in one case.⁴

5. *Origin of Branches also Presents a Wide Range of Differences.* As one would expect, the greater number of vessels are given off from the aorta in the ordinary way, but in almost all the cases, in addition to this, there are some vessels which open from the aneurismal sac in one or more of the following ways:

(a) Branches given directly from the sac, but their point of origin remaining as a free opening between the aorta and sac.⁵

(b) In certain cases branches are given off directly from the sac with no point in the aortic wall to mark their true origin.⁶ (In a number the inferior mesenteric artery was of this arrangement.⁷) While in this case, although the inferior mesenteric artery did open directly from the sac, the original opening from the aorta seems to be marked by the fibrous nodule already referred to.

6. *Dissection.* In practically all the cases found in which histological examination was made the dissection took place between the laminae of the media,⁸ and in several it is reported that a new intima was developed.

7. *Method of Repair or Compensation.* According to Adami,⁹ this may take place in one of two ways: (a) There may be formation of clot, with obliteration of sac (unusual), or (b) secondary openings are established between the sac and aorta, or between subdivisions of these—e. g., in this case between the true common iliac and the dissected common iliacs.

8. *Clinical Diagnosis.* Probably, aside from the curiosity of such a case, the most interesting feature would be the possibility of diagnosing this condition of affairs during the patient's life.

The difficulty of doing this may be realized when we find that up to 1897 there is only one case in the literature in which the diagnosis of the dissecting aneurism of this kind was made *intra vitam* and confirmed by autopsy, and this was in 1856 by a Dr. Swain.¹⁰

There are, however, on record¹¹ eight cases, with autopsy, in which, although the diagnosis was not made during the patient's life, their histories all had certain points in common, viz., at the time of probable rupture there was a history of sudden pain in the chest, worse on the left side, shooting into the back and abdomen, so severe that it usually caused unconsciousness, in some instances accompanied by the sensation "as if something had given away." It differed from anginal pain in that it gave no feeling of constriction of the chest or of impending death, and in no case did it radiate down the arm.

Subsequently most of the patients presented symptoms of interference with the circulation from some chronic disease, as palpitation, dyspnoea, œdema, etc.¹²

To summarize the special points of interest in this case :

1. The generally dilated condition of arteries throughout the body.
2. The presence of an accompanying sacculated aneurism.
3. The fusiform dilatation of the dissecting aneurism above the origin of the coeliac axis, partially filled with laminated clot.
4. The dissection taking place anteriorly.
5. The complete transplantation of two branches of the aorta—left suprarenal and inferior mesenteric.
6. The original opening of the inferior mesenteric artery shown closed by a fibrous nodule.

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ON THE SO-CALLED "IRRITABLE BLADDER" IN THE FEMALE.

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ONE of the frequent as well as very distressing conditions in the female which the general physician or the gynecologist is called upon to treat is that complex of symptoms which is generally called "irritable bladder." This name is applied to that condition in which the patient exhibits an abnormal frequency of urination, accompanied by a varying degree of tenesmus; in other words, where the symptoms do not, owing to the absence of pus in the urine, allow of a diagnosis of cystitis, and where the diagnosis of diabetes or nephritis cannot be made to account for the frequent urination, that of "a bladder neurosis" or "irritable bladder" results, for want of a more careful examination, in most instances. During recent years, however, competent and careful observers have, chiefly with the aid of the cystoscope, determined

that the *real* irritable bladder is, indeed, a rarity, if it exists at all, and that the term employed is a misnomer. I have satisfied myself, by careful urological as well as gynecological examination, in connection with my colleague, Dr. Richard Knorr, of a large number of cases presenting symptoms of "irritable bladder," that few, if any, of these cases could not be shown to rest upon some tangible abnormal condition of either urethra, bladder, or neighboring organs; and as a result of these investigations I fully agree with Winter,¹ that it is only after a most complete and careful examination of the genito-urinary and pelvic organs that we may venture upon the diagnosis of a pure bladder neurosis.

SYMPTOMATOLOGY. The symptoms are but few in number—frequency of urination and a varying degree of pain or tenesmus.

Frequency. What constitutes *abnormal* frequency of urination? We cannot look upon the polyuria resulting from the imbibition of large quantities of fluids, or as a result of diabetes or interstitial nephritis, or the temporary increase in frequency and volume which in persons of nervous temperament results from excitement, as being abnormal; nor is the fact of a woman's having to urinate *after* arising, during the night, proof of any abnormality. In the former instances the pressure of the volume of fluid, in the last the effect of the shifting of the point of greatest pressure to the region of the sphincter as well as the additional influence of the change in the temperature of the surroundings, must be looked upon as normal stimuli to urination. Under normal conditions the adult female urinates four or five times during the day and not at all during the night. Where the act is performed oftener during the day, or where the woman is *awakened by the desire to urinate* during the night, we must look upon the condition as abnormal. Winter's² definition of abnormal urination is in this respect clear and correct. He says: "We must look upon a desire to urinate as being pathological when it is continuously aroused by small quantities of urine, when it cannot be suppressed, and when it is painful." I would add: "And when it does not entirely disappear after the completion of urination."

Pain and Tenesmus. Here we meet with as marked degree of difference in the severity of the symptoms as we do in the frequency of urination. We must bear in mind, too, the difference in degree of susceptibility to pain which different natures exhibit. What the phlegmatic woman describes as "only a little discomfort" the neurasthenic type may magnify into "unbearable discomfort" and "stabbing, cutting pains." However, almost every one of the patients will state that there is either a sense of pressure before urination, an increased desire to empty the bladder, which desire in some instances demands instant compliance, as otherwise the urine is expelled into the clothing, or they state that urination is accompanied by pain, varying from a slight, burning sen-

sation to sharp and cutting; or that after emptying the bladder there is a varying degree of tenesmus and discomfort, which they describe as "a feeling as if I had to pass a few drops more and couldn't." Finally, there may be a combination of these symptoms.

Urine. If the entire quantity of urine passed in the twenty-four hours be measured it will be found to fluctuate within normal bounds, although the amount passed at each urination varies from only a few drops to a reasonable quantity. Its composition, too, is normal, and if turbidity be present it is usually due to phosphates. Frequently, however, a slight, flocculent clouding is noticed, which proves on sedimentation to be due to mucin, large, squamous epithelia from the bladder, and a few leucocytes. Bacteria, if present, are seen in only very small number (not enough to produce a true bacteriuria). The reaction may be alkaline, neutral or acid—an argument against the statement made by some that the condition may be due to "highly concentrated urine."

CAUSES. The fact that the urine which enters the bladder is not immediately expelled through the urethra depends upon the closure of the outlet at the neck of the viscus by the tonic contraction of the sphincter vesicæ—in woman the sphincter internus—and, in addition, the striped muscular fibres of the upper portion of the urethra, which latter are called into play when a voluntary effort is aroused to support the sphincter proper in retaining the bladder contents. Von Frankl-Hochwardt and Zuckerkandl¹ explain the mechanism of urination as follows: "At first gradual filling of the bladder with urine, then a desire to urinate, which increases in intensity; as a result of this, at first an increase in the already present tonic contraction of the sphincter, which then relaxes in children and those persons ill with disease of the nervous system, and results in expulsion of the urine, while older individuals resist this still further, probably by voluntarily increasing the sphincter contraction, but at all events by calling the voluntary auxiliary muscle-fibres into play. When the opportunity to urinate presents the closure is relaxed and the detrusor comes into play as an expulsive power."

In the normal bladder, whose mucous membrane possesses a low degree of sensibility, the tonic contraction of the sphincter is inhibited voluntarily, or the distention of the viscus and the consequent stimulus to its sensory nerves cause, through reflex action, the inhibition of sphincteral contraction. In the abnormal, or inflamed, bladder the increased irritability of the diseased mucous membrane and its contained nerve-endings render them responsive to a far weaker stimulus (a far smaller volume of contents than the normal), and causes the desire to urinate even before distention occurs. Where the elasticity or distensibility of the bladder-wall is diminished, there is an artificial sensation of distention, and much earlier than under normal conditions; there-

fore, any condition which increases the reflex irritability or the direct sensibility of the vesical mucous membrane must be looked upon as a cause of "irritable bladder," be that condition intravesical or extravescical.

As causes of vesical hyperæsthesia (irritable bladder) many authors have given a goodly array of symptoms, some based upon observation, others upon supposition. Olshausen⁴ was very near the truth when he spoke thus of this condition: "This complex of symptoms may depend upon numerous diseases of the bladder and urethra."

The causes of vesical hyperæsthesia given by various authors (Peyer,⁵ Winter,⁶ Güterbock⁷ and others) are as follows:

1. *Urethral*. Urethritis, fissure of the urethra, condylomata, urethral caruncle, malignant tumors, periurethral processes.

2. *Vesical*. Cystitis, hyperæmia and varices, tumors, foreign bodies, ulcerations, atrophy of the bladder, trauma.

3. *Perivesical*. Uterine tumors which displace or flex the body of the cervix forward, as myoma, carcinoma, etc., pregnancy, malpositions of the uterus, new-growths at the cervix uteri or in the vesico-vaginal septum or parametrium, exudates, parametritis, perimetritis, metritis, salpingitis, ovaritis, hæmatocele, pelvic abscesses, pelvic peritonitis and cellulitis, extra-uterine pregnancy, vulvitis, colpitis, and intestinal changes (inflammations, parasites, constipation, diarrhoea).

4. *Nervous System*. Neurasthenia, hysteria and allied neuroses, ataxia, multiple sclerosis, etc.

In my own researches the results of careful examination in a series of fifty-seven cases were as follows:

Hyperæmia, alone or as an accompanying condition, in	14
Vesical varices, " " " " "	5
Cystitis, " " " " "	27
Pericystitis, as an accompanying condition, in	27
Pregnancy, with accompanying conditions, in	5
Cystocele, alone or with accompanying conditions, in	4
Malpositions of the uterus, as accompanying conditions, in	10
Carcinoma, extravescical, in	3
Tuberculosis, vesical, in	1
Nervous conditions, as accompanying conditions, in	4

It is of interest to note in connection with the above that in forty-six cases there was either an inflammation or a hyperæmic condition of the mucous membrane present, and that of those patients who presented nervous symptoms in only one were they present without some *appreciable* vesical or perivesical cause. Of these one case (Case XIX.), which later developed symptoms of tabes dorsalis, had, in addition, a cystitis colli; another (Case LXI.), an epileptic, pericystitis and distinct hyperæmia at the fundus. One other (Case LI.) was that of a patient of

neurasthenic type; but here also decided vesical and perivesical changes were discoverable.

While I am not in the position to deny that vesical hyperæsthesia as a pure neurosis may exist, I do not hesitate to say that if a *thorough* examination of the urethra, bladder, and pelvic organs be made some tangible cause of the hypersensitive condition of the mucous membrane, either vesical or perivesical, will be found in almost every if not every case.

DIAGNOSIS. The diagnosis must be one of exclusion, and cannot rest upon an examination of the bladder only. If verbal examination discloses an abnormal frequency of urination, with or without tenesmus or pain, our next step must be to examine the patient systematically, not only with regard to the bladder, however. Thus, the presence of diseases or abnormalities of the vulva, vagina, uterus, tubes, ovaries, and parametrium, of rectum and the rest of the intestinal tract, of the urethra, bladder, and kidneys, must be sought for. I shall not enter into the details concerning the diagnosis of each of these conditions, but content myself with having mentioned them among the causes, with the exception of those of the urethra and bladder and of those perivesical changes which may be recognized with the cystoscope.

For the external urethral orifice ocular examination will suffice. This examination must also decide upon the presence or absence of discharge, which must, if present, be microscopically examined. For the examination of the rest of the urethral canal I prefer the Nitze-Oberlaender endoscope, for the source of light with this instrument is very near the object to be examined, as it allows an exact diagnosis, does not injure the urethral membrane, and need not be in the least painful. I have used the same sized tubes as in the male, for it has been my experience that, although the urethra itself is capable of considerable dilatation without causing pain, the meatus is not. The metallic tubes also are to be sterilized by boiling. It goes without saying that the external genitals, too, must be cleansed before endoscopic or cystoscopic examination.

The picture presented will be that in inflammatory processes producing infiltration of the mucous membrane the surface of the membrane is of a deeper red color than normal, loses its glistening brilliancy, and one sees that the folds are more or less obliterated. The urethral caruncle, when present, has an angry, red, smooth surface. Polypi usually have the same color as the surrounding membrane, and rise from a broad base. Papillomata are recognizable by their berry-like, irregular surface and their narrow pedicle. Fissures are, as a rule, easily recognizable, and are usually marked by a pearly-gray line on either side of the line of rupture itself. In periurethral processes which lead to pressure and stricturing, the lumen of the urethra will be seen to be irregularly or concentrically narrowed.

For cystoscopic examination I have employed the Nitze instrument. It is placed in a 2 to 3 per cent. solution of holzin (a 60 per cent. solution of formalin in alcohol) for from five to ten minutes at least. This preparation is a powerful germicide; as stated by Kollin,⁸ it is non-irritant and non-toxic and does not injure the instruments. The patient lies in a semi-recumbent position, with the thighs drawn up and separated and knees bent, at such a height that the urethral orifice is at about the level of the eye of the examiner seated before her. All the urine is drawn off. The bladder is thoroughly irrigated with a 1 per cent. solution of boric acid and filled by a syringe with a quantity of the same solution sufficient to distend it gently. The cystoscope is, without being dried of the holzin solution, lubricated with sterilized glycerin and inserted carefully into the bladder, the light having first been tried. The bladder is now carefully and systematically examined. The examination completed, the instrument is removed after the lamp has been extinguished and has had sufficient time to cool, and all except 50 to 75 grammes of the boric-acid solution drained off. Where a local cystitis is present, or where the urine contains bacteria, the entire quantity of the solution is removed and 25 to 50 grammes of a $\frac{1}{2}$ to $\frac{1}{4}$ per cent. solution of nitrate of silver injected and allowed to remain for about five minutes; it is then allowed to flow off. The bladder is again irrigated with boric-acid solution, and after this returns clear about 50 to 75 grammes of the solution are injected and allowed to remain. In this way infection (Rovzing⁹) is almost with certainty avoided, and the colicky pains following the use of the nitrate solution are reduced to the minimum.

At the present day, and in view of the comparative safety with which the cystoscope may be employed and of the certainty and completeness of the results it affords, I can only speak of the use of the sound as a means of diagnosis in diseases of the bladder as antiquated and unwarranted, if not dangerous.

When referring to the cystoscopic examination of the female, those authors who are not very familiar with its difficulties speak of them rather slightly. Owing to the greater length of the urethra in the male, the *insertion* of the instrument is more difficult; but once in the bladder the rest is much easier than in the female. Frequent use of the instrument in both sexes has convinced me of the truth of this assertion.

CYSTOSCOPIC DIAGNOSTIC FEATURES. *Hyperæmia*. Wherever this occurs we see an abnormal reddening of the mucous membrane over the parts involved, and on closer examination discover that this has for its cause a dilatation of the minute bloodvessels, so that the reddish-yellow color of the normal mucous membrane is seen only in little patches shining between the dilated vessels. Important as a diagnostic

point is the fact that we can still distinguish the individual vessels of the network in all their fine ramifications. According to the degree of severity of the process, we see that the larger, or these and the smaller, vessels are involved. This condition may be due either to some direct irritation of the mucous membrane, or it is secondary to pelvic congestive processes or the pressure of other organs. Zuckerkandl¹⁰ considers local hyperæmia as being a cause of vesical hyperæsthesia, saying: "I wish to state, at the beginning, that by means of the diagnostic methods mentioned (cystoscopy and urethroscopy) I have in certain cases of irritable bladder been able to discover localized hyperæmias at the fundus of the bladder (independent of any inflammation) extending from the ureteral orifices to the orificium internum, as also hyperæmia of the posterior portion of the urethra. I have gained the impression that the above-mentioned localized hyperæmias are, as such, the causes which have for their result the increased sensibility of the mucous membrane and its heightened reflex irritability." As a result of my own observations I fully agree with his statements. He also speaks of the occurrence of vesical hyperæsthesia as an accompaniment of menstruation, pregnancy, coitus, etc. In another article¹¹ he mentions the increased liability of cystitis to result from vesical hyperæmia. In this connection see Cases XIV., XXVIII., XXXII., XXXV., XXXVII., XXXIX., XLI., XLIV., XLVII., L., LI., LII., LIV., LV., LVII.

Vesical Varices. Where direct pressure is exerted upon larger vessels outside of the bladder-wall (principally the pelvic venous trunks) we have a form of hyperæmia which differs decidedly from the first mentioned. It takes the form of dilatation of the larger vessels (veins), and this dilatation varies in degree from merely a marked increase in the development and number of those venous plexuses which are visible under normal circumstances to a distinct varicosity, in which the vessels rise above the level of the surrounding mucous membrane to a pronounced degree, and are plainly visible as tortuous, bluish-red cords. This condition usually occurs as an accompaniment of pregnancy or tumor. Zuckerkandl¹² mentions the fact that in some of his cases he observed that the veins at the base of the bladder, from urethra to fundus, were distended with blood during pregnancy, and also noticed varicose, serpentine vessels. In several of my own cases these varices were well marked. In one during pregnancy, in a patient with a pronounced mitral insufficiency, the entire neck of the bladder, completely surrounding the sphincter, though most marked at the trigonum, was marked by prominent, tortuous vessels, which rose well above the surrounding, healthy mucous membrane. In between the varices could be seen other vessels dilated, though not varicose. (See Cases XVIII., XXII., XXIX., XLV., LV., LVII.)

Cystitis. It is not within the province of this paper to discuss the existence or non-existence of a true "catarrhal cystitis." Suffice it to say that I am entirely of the opinion advanced by Rovzing⁹ that it *does* exist. In such cases the urine is either clear or turbid, the turbidity being caused by phosphates. The sediment contains epithelia, mucous strings, a few bacteria, and isolated leucocytes. Where in our cases turbidity rested upon purulency of the urine the case was not considered as coming within the scope of those permissible for this article. Cystoscopy revealed the conditions described by Nitze,¹³ Viertel,¹⁴ and Rovzing.⁹ The mucous membrane was diffusely reddened, and, especially in the neighborhood of the sphincteral margin, its surface swollen and irregular. It had lost its normal gloss and taken on a "satiny" appearance (Nitze¹³). There were no longer any islets of normal mucous membrane to be seen, nor any individual vessel outlines discernible except at the margins, where the process gradually faded away into what might be termed a hyperæmia. The area of inflammation usually extended beyond the ligamentum interuretericum and beyond the ureteral orifices laterally. In some instances other points than the trigonum were affected, and there the margins of the inflamed areas could be distinctly seen to be lifted above the surrounding healthy mucosa. The surface of the inflamed membrane was at times marked by small, hemorrhagic extravasations and clots, and was exceedingly tender, bleeding at the slightest touch. In one case three small, superficial ulcerations on an inflammatory base were noticed directly within the sphincter.

An interesting point was a change somewhat similar to if not identical with that described by Viertel,¹⁴ who says: "The trigonum is frequently the seat of a large number of cysts of the size of a poppy-seed to that of a millet-seed, etc. These cysts often extend from the apex of the trigonum through the sphincter into the urethra." That which I am about to describe verified the belief he expressed at another part of his admirable article: "Although the mucous membrane is in its normal state as smooth as a mirror, it gives the impression of a peculiar roughening in catarrh, which Nitze calls 'satiny,' and which, in by far the greater number of cases, is caused by the diminished power of reflection of those areas which are denuded of epithelium, while it is my opinion that, in other cases, this appearance occurs in connection with the beginning of a diffuse formation of papillæ." I was able in two cases described in this article (Cases VI. and XXXVIII.), as well as in several others of cystitis suppurativa, to determine that this appearance is sometimes due to a diffuse hypertrophy of the papillæ at the trigonum. The surface of the inflamed mucosa presented a satiny, roughened appearance; on closer examination I believed I was able to discover papilla-like excrescences. To decide the question I employed

the ureter cystoscope, passed a ureter catheter into the bladder, and laid it directly upon the inflamed area, into which it sank, revealing in most beautiful distinctness the rosy, satiny, *non-transparent*, hypertrophied individual papillæ standing out clearly in contrast to the brown color of the catheter. This "cystitis papillomatosa," as we have termed it, presents characteristics entirely distinct from "œdema bullosum," in that it is plainly evident upon close examination that we have to deal not with cysts but with hypertrophied papillæ.

In all but one of the twenty-seven cases under consideration presenting evidences of cystitis (all of the catarrhal variety) the process was confined to the fundus of the bladder, or to this with, in addition, small, circumscribed areas elsewhere; and in that one in which the process was diffuse, I believe it to have been only a stage preceding a suppurative, diffuse cystitis, and secondary to a catarrhal cystitis colli. (See Cases I., III., V., VI., IX., X., XV., XVI., XVII., XIX., XX., XXI., XXIII., XXV., XXVI., XXVII., XXXI., XXXIII., XXXIV., XL., XLIII., XLVII., XLVIII., LII., LIII., LIV.)

Pericystitis. When this condition occurs it is usually only as a part or as a result of a preceding perimetritis or a parametritis. One phenomenon of this etiological factor is that the processes described under this heading usually affect only, or chiefly, the posterior and postero-lateral parts of the bladder-wall, and of these principally the lower portion. I have comparatively seldom seen its results affecting the apex or the anterior wall of the viscus. Where the exudate is recent, and still in a fluid, or semi-fluid state, we find no local changes in the bladder-wall which are recognizable with the cystoscope. At most the process of preliminary filling of the bladder is unusually difficult or painful, or it may act as an obstruction to the insertion and proper manipulation of the cystoscope; but where the exudate has gone on to organization, and cicatrix-like fibrous tissue has resulted, the distortion of the bladder-wall consequent upon the connective-tissue strands is plainly evident. Here it may result either in a pronounced "pocket" formation, unilateral or bilateral, in which case the entire region of the trigonum stands out as a sort of curved partition between two cul-de-sacs, or the mucous membrane is raised and stretched taut over columnar-like strands or bands, which stand prominently out above the surrounding mucosa, somewhat resembling the individual columns in the "vessie à colonne." They differ from this, however, in that they occur in cases where there is a history of preceding pelvic inflammation, and where there is absolutely *no obstruction* to the outflow of the urine, and in that they are usually visible over only a part of the bladder-wall, that their outline is sharper, the interspaces not so regular nor so pronounced as in *vessie à colonne*, and that the tendency is for them to present fimbriated ends, which apparently merge gradually into

the normal wall. They are analogous to the peritonitic adhesions affecting the viscera seen in laparotomies. I have seen no mention of this condition in the literature upon the subject; nevertheless, I look upon it as being a potent factor in causing vesical hyperæsthesia, first, by aiding extravescical conditions in the production of hyperæmia, and, secondly, by limiting the normal expansibility of the elastic bladder-wall. In this condition smaller volumes of urine than the normal cause tension upon these strands and upon the bladder-wall overlying and connected with them. In this way reflexes are caused which are analogous to those which in the normal bladder are caused by distention of the viscus, and the desire to urinate results abnormally early. (See Cases I. to VI., XI. to XIV., XXI., XXIII., XXVII., XXXVII., XXXVIII., XL., XLI., XLIII., XLV., XLVII., LI., LIII., LIV., LVI., LVII.)

Pregnancy. Here we have to deal with the direct pressure of the distended uterus upon the bladder, or with the hyperæmia, varices, cystitis, etc., which may occur, even in the early stages of pregnancy, as the result of this pressure, all of which causes may result in vesical hyperæsthesia (Peyer,¹⁶ Fritsch,¹⁸ Zuckerkandl,¹² Viertel,¹⁴ Casper¹⁵). Where pericystitic strands are present the condition is still further complicated. The pregnant uterus is seen protruding as a large mass into the bladder cavity, which assumes, even when it is filled with a larger quantity of solution than usual, a crescentic form. The mucous membrane covering the tumor is free of inflammatory changes, but is marked with striæ, most likely the fibre bundles of the circular muscular layer in the uterine wall seen through the wall of the bladder. The most striking phenomenon, however, is the development or multiplication of the venous plexuses in the bladder-wall, which toward the neck of the bladder may become distinctly varicose, as before mentioned. (See Cases IV., XVIII., XXI., XXII., XXVI., XXVIII., XLIV., LII.)

Cystocele. A cystocele occurring alone shows no inflammatory changes in the mucous membrane. The form of the bladder cavity is, however, decidedly changed. If the prolapsed viscus be simply filled with fluid and the cystoscope inserted the observer looks through a more or less irregular opening down into a partially illuminated cavity, whose margins are sometimes plicated. If the distended viscus be replaced and retained in position the site of the prolapse will be found folded and creased. (See Cases VII., VIII., XXIV., XXXI.)

Malpositions of the Uterus, etc. These are only diagnosticable when the cervix or the body presses upon the bladder. Usually it is the cervix of an adherent, retroflexed uterus. This presses the lower posterior portion of the wall of the bladder forward, and is plainly visible as a brightly illuminated prominence, whose contour shades gradually

away into the normal bladder outlines. Where the fundus is displaced forward, the picture resembles that of the pregnant uterus, in lesser degree, however, and minus the striations. Tubal or ovarian tumors cause a protrusion into one or other side of the bladder cavity. (See Cases XIV., XXXII., XXXIX., XLVIII., L., LI., LIII., LV., LVI.)

Carcinoma. This is seldom primary, but usually a result of the extension of the neoplasm from the uterus to the parametrium and thence to the bladder-wall. Usually it is the region of the trigonum which is attacked, and the picture seen in the cystoscope is so characteristic as to almost preclude the possibility of mistake. The entire floor of the bladder is lifted into smooth, rounded folds, especially at or near the ligamentum interuretericum, which stands forth most prominently. These folds extend transversely, and usually beyond the trigonum, overlapping it laterally and posteriorly. The ureteral orifice may be apparently obliterated and be visible only momentarily as a dark opening (during the act of discharging urine) upon one of the folds, or it may be hidden in the depths of a convoluted, trumpet-shaped depression. The mucous membrane covering the neoplasm is not inflamed, except where the ulceration has begun, or is soon to occur, but has an œdematous appearance and is frequently the seat of "œdema bullosum" (described by Kolischer¹⁶). This condition is marked by the formation of vesicles or bullæ upon the membrane. In several cases of vesical neoplasm, as well as in one of an ulceration due to cauterization, I was able to discern semi-transparent, cyst-like formations, varying in size from a small seed to a large pea, covered with whitish-pink, velvety mucous membrane, all gloss having been lost. (See Cases XXX. and XLII.)

Tuberculosis. The local phenomena seen in vesical tuberculosis are the small, gray, tuberculous nodule, the tuberculous ulceration, and ecchymosis, which phenomena are visible chiefly in the neighborhood of the ureteral orifices and at the fundus (Casper¹⁵). This author speaks of the phenomena as follows: "For the diagnosis of vesical tuberculosis, before everything else the occurrence of ulcerations ("geschwüre") in the bladder is necessary. The ulcers which we have seen show nothing in any way typical of tuberculosis," etc. Antal,¹⁷ quoted by Casper, describes a case in which two ulcerations, with raised, yellowish edges, one of the ulcerations being surrounded by several smaller ones, were present near the bladder orifice. The surface of the mucous membrane in the spaces between the ulcerations was covered with tubercles, some whitish-gray, some yellow. Casper¹⁵ was able in three cases to recognize miliary tubercles positively. He furthermore adds that in no case has he failed to find ecchymoses. In the one case which came under my observation (Case XLIX.), and in which the process had not yet developed into a cystitis, an advanced phthisis pulmonalis

was present. The specimens of urine sediment were, unfortunately, spoiled by an assistant during their preparation, and as the patient only presented herself once, no further urinary examination could be made. The cystoscope revealed a shallow ulceration, somewhat larger than an almond, rising from normal mucous membrane and surrounded by a narrow margin of inflammation. It was situated on the lower left posterior wall; had clean-cut edges, somewhat irregular outlines, and its surface was covered with a layer of grayish material. No ecchymoses were discoverable in any part of the bladder-wall.

Calculi. These are of comparatively infrequent occurrence in the female bladder, while foreign bodies are more frequent than in the male. These, as well as tumors, should offer no difficulties to recognition by the competent examiner.

I do not enter into the description of the cystoscopic picture to be seen in other conditions of the bladder or of the kidney, for these do not properly come under the head of the causes of vesical hyperæsthesia.

Abstracts of Clinical Histories of Cases.

CASE I. *Cystitis colli; pericystitis.*—Frau S., aged forty-three years; June 7, 1899. Parametritis posteriora. Frequent urination, day and night; tenesmus and some pain. One to two years' duration.

Urine. Slightly turbid.

Cystoscopy. Diffuse redness at trigonum; bilateral distortion, more marked on the left side.

Therapy. Irrigation with boric-acid solution; salol internally.

June 27th. All symptoms disappeared.

July 8th. Discharged cured.

September 29th. Reports her condition as continually normal. Cystoscopy reveals normal bladder.

CASE II. *Cystitis colli; pericystitis.*—Fraulein C. S.; June 27th. Pyosalpinx, retroversio fixata. Frequent urination.

Urine. Normal.

Cystoscopy. Diffuse reddening at trigonum; right-sided distortion.

Therapy. Irrigation with boric-acid solution.

June 17th. Symptoms have abated.

July 11th. Symptoms have disappeared; bladder normal. Discharged cured.

CASE III. *Cystitis colli; pericystitis.*—Frau L.; June 9th. Extirpatio uteri (carcinoma); frequent urination during day and once or twice during night.

Urine. Normal; alkaline.

Cystoscopy. Diffuse reddening at trigonum, with several small "granulations" on the left side of floor of bladder; left-sided distortion.

Therapy. Irrigations with boric-acid solution; internally, boric-acid solution (2 per cent.), 4 grammes four times daily (discontinued after four days).

June 15th. Now retains urine for three hours during the day and all night.

17th. Treatment discontinued.

August 26th. Condition normal. Cystoscopy reveals normal mucous membrane; distortion still present; discharged *cured*.

CASE IV. *Pregnancy; pericystitis*.—Frau P.; June 9th. Parametritis posteriora; pregnancy (second month); frequent urination.

Urine. Normal.

Cystoscopy. Reveals bilateral distortion of bladder; mucous membrane normal.

Therapy. Irrigations with boric-acid solution.

June 17th. Can retain urine for much longer periods. Later withdrew from treatment *improved*.

CASE V. *Cystitis colli; pericystitis*.—Frau B.; June 11th. Endometritis catarrhalis; retropositio; urinates once or twice every hour.

Urine. Normal.

Cystoscopy. Inflammation of mucous membrane of entire trigonum; left-sided distortion. Declined treatment.

CASE VI. *Cystitis colli; pericystitis*.—Frau S., aged fifty-two years; June 15th. Complains of frequent urination; no pain.

Urine. Normal.

Cystoscopy. Entire trigonum diffusely reddened and the seat of papiloma-like hypertrophy of the mucous membrane; left-sided distortion. Declined treatment.

CASE VII. *Cystocele; vascular dilatation (hyperæmia)*.—Frau Sch.; June 15th. Prolapsus uteri; frequent urination, and must each time lift the prolapsed uterus; no pain or tenesmus.

Urine. Slightly cloudy (phosphates).

Cystoscopy. Vessels at sphincter on the bladder floor, distended; marked folds in the mucous membrane of this region. Operation for the correction of the prolapse advised.

CASE VIII. *Cystocele*.—Frau D., aged thirty-eight years; June 17th. Prolapsus vaginæ anteriora: retroflexio uteri; frequent urination, both day and night.

Urine. Normal.

Cystoscopy. Mucous membrane normal; floor of bladder shows distinct folds and creases.

Therapy. Irrigations with boric-acid solution.

July 5th. Much improved; retains urine for two hours during the day and all night. Withdrew from treatment *improved*.

CASE IX. *Cystitis colli*.—Frau H., aged twenty-eight years; June 20th. Perimetritis posteriora; frequent urination during day and two or three times during night; pain and tenesmus.

Urine. Normal.

Cystoscopy. Cystitis at trigonum. Declined treatment.

CASE X. *Cystitis diffusa (catarrhalis subacuta)*.—Frau W., aged thirty years; July 5th. Retroversio fixata; urination every five to ten minutes during day and several times during night; pain and tenesmus.

Urine. Turbid (phosphates).

Cystoscopy. Mucous membrane of entire bladder diffusely and deeply reddened, especially in the region of the trigonum.

Therapy. Irrigation with boric-acid solution and instillation of nitrate of silver solution.

July 12th. Normal urination; urine clear.

14th. Bladder-walls now only slightly hyperæmic.

19th. Urination continues normal. Patient withdrew from treatment; discharged *improved*.

CASE XI. *Pericystitis*.—Frau B., aged thirty-six years; June 22d. Metritis, parametritis; very frequent urination during day and three and four times during night; pain and tenesmus; nine years' duration.

Urine. Normal.

Cystoscopy. Protuberance on left side; folds in floor of bladder.

Therapy. Distention.

July 1st. Frequency and character of urination now normal; cystoscopy reveals normal bladder. Discharged *cured*.

During three months following, with the exception of one period of a few days, the bladder functions remained normal.

CASE XII. *Pericystitis*.—Frau K., aged thirty-five years; June 24th. Parametritis retrahens; abnormally frequent urination during the day and twice during the night; tenesmus and sharp pains in the lower abdomen, chiefly in the left side.

Urine. Turbid (phosphates).

Cystoscopy. Reveals distortion of bladder, especially on the left side. Declined treatment.

CASE XIII. *Pericystitis*.—Frau S., aged thirty-three years; June 24th. Old pyosalpinx (dextra) and perisalpingitis; retroflexio fixata; frequent urination during day and once during night; neither pain nor tenesmus.

Urine. Normal.

Cystoscopy. Marked distortion of the bladder; distinct pericystitic strands, most marked at the bottom, rear, and right-hand sides; mucous membrane otherwise normal.

Therapy. Distention.

July 10th. Has not had to urinate during night for seventeen days; during day every two to three hours. Withdrew from treatment later.

September 13th. Reports that urinary functions have remained normal. Cystoscopy reveals normal bladder with the exception of the distortion and two small papillomata. Discharged *cured*.

CASE XIV. *Pericystitis; vascular dilatation*.—Frau H., aged thirty years; June 27th. Urinates hourly during the day, not at all during the night.

Urine. Normal.

Cystoscopy. Normal mucous membrane; protuberance on left side of bladder (extravesical); cervix uteri bulges the bladder-wall forward; bilateral distortion; dilatation of vessels of trigonum.

Therapy. Distention; one treatment.

Reported that frequency of urination was diminished. Discharged *improved*.

CASE XV. *Cystitis colli (gonorrhœica?)*.—Frau G., aged thirty years; July 3d. Urethritis, cervical endometritis, salpingitis duplex; frequent urination; tenesmus during the day, but not during the night.

Urine. Normal.

Cystoscopy. Diffuse, deep redness of the trigonum, extending, on the left side, to and about the ureteral orifice; on the right side, a distinct extravesical tumor (salpingeal?). At the sphincter the mucous membrane is hypertrophied and presents papilloma-like excrescences.

Therapy. Irrigations with boric-acid solution and instillations of nitrate of silver.

July 8th. Retains urine for three to four hours; neither pain nor tenesmus. Discharged cured.

On July 10th the urethral discharge was examined and found to contain leucocytes and typical intracellular gonococci. Up to July 20th the bladder symptoms had not returned.

CASE XVI. *Cystitis colli*.—Frau Sch., aged thirty-four years; August 28th. Perimetritis posteriora, endometritis; urination every quarter to half-hour during the day and once or twice during the night; pain and tenesmus.

Urine. Normal.

Cystoscopy. Area of inflammation at the trigonum, extending somewhat beyond the ligamentum interuretericum, with an almond-sized area (apparently an ulceration) in the centre of the inflamed area, and covered with what is apparently a layer of muco-pus.

Therapy. Irrigations of boric-acid solution and instillations of nitrate of silver solution.

August 31st. Somewhat improved; endoscopy reveals normal urethra.

September 15th. Urination normal; cystoscopy reveals normal bladder. Discharged cured.

October 2d. Bladder functions have remained normal; cystoscopy reveals normal bladder.

CASE XVII. *Cystitis colli*.—Frau R., aged fifty-two years; July 3d. Urination every half-hour during day, oftener during night; tenesmus; condition of fifteen years' duration.

Urine. Normal.

Cystoscopy. Area of inflammation at the trigonum.

Therapy. Irrigation with boric-acid solution.

July 8th. Retains urine one and a half hours during the day and all night; urine alkaline, slightly turbid (phosphates). Given boric-acid solution (3.5 per cent.), 4 grammes three times daily.

21st. Urinates at three to four-hour intervals during day, not at all during night; neither pain nor tenesmus; cystoscope reveals normal mucous membrane. Discharged cured.

September 5th. Functions have remained normal. Cystoscopy reveals normal mucous membrane.

CASE XVIII. *Pregnancy; venous plexuses*.—Frau G., aged twenty-six years; July 13th. Pregnant (fifth month); frequent urination.

Urine. Turbid (urates).

Cystoscopy. Gravid uterus plainly visible, protruding into the vesical cavity; abnormally prominent venous plexuses at both sides of body of bladder. Treatment not indicated.

CASE XIX. *Cystitis colli; tabes dorsalis*.—Frau de la G., aged forty-four years; July 13th. Frequent urination, especially during the night; at times nocturnal enuresis.

Urine. Slightly turbid; contains albumin; in sediment mucus and epithelia.

Cystoscopy. Fundus (left side toward rear) inflamed, and in and over this area are several reddish excrescences; small flakes and pellets of muco-pus on floor of bladder. Declined treatment.

CASE XX. *Cystitis colli*.—Frau B., aged twenty-two years; July 27th. Frequent urination day and night; burning.

Urine. Normal.

Cystoscopy. Mild degree of cystitis at trigonum, extending beyond the ligamentum interuretericum; rest of mucous membrane normal.

Therapy. Irrigations of boric-acid solution.

August 4th. Marked improvement; need not urinate during the night; urine normal (alkaline). Boric-acid solution (3.5 per cent.), 4 grammes three times daily.

7th. Cystoscopy reveals some reddening of the mucous membrane still. Nitrate of silver instillation. Patient withdrew from treatment improved.

CASE XXI. *Cystitis colli; pregnancy; pericystitis.*—Frau L., aged forty years; July 27th. Pregnant (fourth month); frequent urination; burning pain and tenesmus.

Urine. Normal.

Cystoscopy. Pronounced cystitis at trigonum; on right side and rear wall areas of localized cystitis; bladder-walls on right side and rear distorted by numerous marked pericystitic strands; uterus protrudes pronouncedly into the bladder cavity. Declined treatment.

CASE XXII. *Pregnancy; vesical varices.*—Frau F., aged thirty-four years; August 2d. Pregnant (sixth month); retroflexio fixata, colpitis; frequent micturition, burning pain, and tenesmus, especially during the night. Eight days' duration.

Urine. Turbid (phosphates).

Cystoscopy. Distinct distention of all visible bloodvessels, which are lifted plainly above the rest of the mucous membrane; this is especially well marked at the base of the bladder and sphincter internus; mucous membrane otherwise normal; uterus distinctly visible. Referred to the gynecological division.

CASE XXIII. *Cystitis colli; pericystitis; carunculæ urethrales; fissura urethrae.*—Frau K., aged thirty-six years; August 4th. Frequent urination, day and night; burning pain.

Urine. Normal.

Cystoscopy. Localized cystitis at trigonum. Left-sided distortion of bladder.

Urethra very sensitive.

Therapy. Irrigations. Internally, boric acid solution (3.05 per cent.), 4 grammes, three times daily (for two weeks).

August 14th. Since above date absent because of menstruation. Condition same.

28th. Improvement slight. Urethra very sensitive. Application of nitrate of silver solution (0.5 per cent.) to entire urethra.

September 1st. Since above date improved. Urethroscope reveals fissure on upper wall of urethra. Application of nitrate of silver solution, 1 per cent.

7th. Retains urine for three to four hours during the day; need not urinate during night at all. Only slight cutting pain with urination. Examination reveals several small caruncles about and just within the external urethral orifice. These removed and bases cauterized with nitrate stick.

21st. Marked lessening in cutting pains.

October 12th. Bladder functions normal. Cystoscopy reveals normal bladder walls. Discharged cured.

CASE XXIV. *Cystocele.*—Frl. S., aged seventy-five years; August 7th. Marked prolapse of anterior and posterior vaginal walls. Fre-

quent painful urination during day and night. Says she must urinate "every few minutes," and then only a few drops at a time.

Urine. Normal.

Cystoscopy. Normal mucous membrane. Marked folds at lower part of rear bladder wall, marking beginning of cystocele.

Therapy (placebo). Irrigations. Internally, boric acid solution (2 per cent.), 4 grammes twice daily.

August 9th. Reports diminution in frequency of urination and pain.

Later withdrew from treatment *improved*.

CASE XXV. *Cystitis colli*.—Frau H., aged twenty-five years; August 10th. Endometritis, parametritis retrahens. Urination every one-quarter to one-half hour during the day. Not during the night. Neither pain nor tenesmus.

Urine. Normal.

Cystoscopy. Cystitis at trigonum, extending from sphincter beyond ligamentum interuretericum.

Therapy. Irrigations.

August 11th. Retains urine for one to one and one-half hours.

16th. Improvement continues. Cystoscopy reveals fundus still decidedly inflamed. Withdrew from treatment *improved*.

CASE XXVI. *Cystitis colli*.—Frau P., aged thirty-three years; August 15th. Status post-abortum. Urinates every one-half to one hour during the day, and several times during the night.

Urine. Slightly turbid.

Cystoscopy. Area of inflammation at trigonum, extending beyond ligamentum interuretericum.

Therapy. Irrigations.

August 24th. No improvement. Urine normal. Instillations of nitrate of silver solution begun.

September 11th. Since above date not treated, because of menstruation. Has become worse.

14th. Urinates less frequently. During night only once. Cystoscopy reveals slight inflammation still present.

23d. Normal frequency of urination; not at all during night. Still slight tenesmus. Cystoscopy reveals some redness still at fundus.

October 12th. Still under observation, much *improved*.

CASE XXVII. *Cystitis colli; pericystitis; renal calculus(?)*.—Frau W., aged twenty-nine years; August 16th. Endometritis cervicis catarrhalis, retropositio uteri fixata. Urination hourly, day and night. Tenesmus.

Urine. Normal. Said to be turbid at times.

Cystoscopy. Inflammation at trigonum; bilateral distortion.

Therapy. Irrigations; massage of uterine adhesions.

August 30th. Frequency diminished. Tenesmus also.

September 5th. Retains urine four hours during the day and all night. Urine turbid, alkaline; contains albumin. Sediment contains many red and a few white blood-cells. Patient states that at times she is troubled with sharp, colicky pains in the left renal region, which radiate toward hypogastric and epigastric regions. Renal region not abnormally sensitive. No enlargement palpable. Catheterism of ureters results in entirely clear urine from right; reddish, slightly turbid urine from left ureter. Turbidity due to blood-cells, chiefly red, which have the "thorn-apple" contour. Urotropin, 0.3, three times daily.

15th. Urine entirely normal. Urinates at normal intervals during the day; not at all during the night. Neither pain nor tenesmus. Cystoscopy reveals normal mucous membrane.

26th. Remains as above. Discharged *cured*.

CASE XXVIII. *Pregnancy; hyperæmia*.—Frau R., aged twenty-two years; August 19th. Pregnant (sixth month); frequent urination during the day; also twice during the night.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum. Uterus plainly visible. No indications for treatment.

CASE XXIX. *Varices*.—Frau W., aged fifty-five years; August 19th. Parametritis posteriora, retropositio uteri. Frequent urination, pain, and tenesmus.

Urine. Normal.

Cystoscopy. Decided dilatation of vessels at trigonum, radiating from sphincter internus. These vessels are raised above the level of the mucous membrane. Slight reddening on lower left posterior wall.

Therapy. Irrigations; boric acid internally.

August 28th. No change. Irrigations and instillations of nitrate solution begun.

30th. Frequency diminished; decrease in pain and tenesmus.

September 9th. Marked improvement. Withdrew from treatment improved.

CASE XXX. *Cystitis colli; carcinoma*.—Frau von der H., aged —; September 9th. Carcinoma uteri et parametrii. Frequent urination; three to four times during the night.

Urine. Slightly turbid.

Cystoscopy. Area of inflammation at trigonum. To left of median line a protuberance, presumably due to neoplasm (extravesical). Referred for operation.

CASE XXXI. *Cystitis colli; cystocele*.—Frau J., aged twenty-seven years; August 23d. Urination every three-quarters of an hour during the day, and once or twice during the night. Tenesmus.

Urine. Normal.

Cystoscopy. Well-marked area of inflammation at trigonum. Declined treatment.

CASE XXXII. *Hyperæmia; retroflexio uteri*.—Frau G., aged forty-four years; August 24th. Dysmenorrhœa, perimetritis posteriora, retroflexio fixata, endometritis hemorrhagica et catarrhalis. Frequent and painful urination (often at one-quarter-hour intervals), with tenesmus.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum. Cervix plainly visible, protruding into bladder cavity. Declined treatment.

CASE XXXIII. *Cystitis colli; parametritis*.—Frau K., aged twenty-eight years; August 25th. Dysmenorrhœa, salpingitis sinistra. Frequent urination during the day and three to four times at night; pain and tenesmus.

Urine. Normal.

Cystoscopy. Area of inflammation, of light degree, at trigonum. Rest of mucous membrane normal.

Therapy. Irrigations and instillations.

August 31st. Cystoscopic examination reveals inflammation of the upper portion of the urethra.

September 4th. Improved. Frequency of urination, pain and tenesmus diminished. Local application of nitrate of silver solution to urethra.

9th. Much improved. Pain and tenesmus disappeared.

18th. No treatment since above date, because of menstruation. Urination normal in frequency and character during the day; during the night, once or twice. Large exudate in left parametrium. Transferred to gynecological division. Discharged *improved*.

CASE XXXIV. *Cystitis colli; retroflexio uteri*.—Frau F., aged twenty-four years; August 25th. Retroflexio mobilis. Urination abnormally frequent both day and night; during the night with pain and tenesmus.

Urine. Normal.

Cystoscopy. Inflammation at trigonum, from sphincter, beyond ligamentum interuretericum. Left-sided distortion. Folds in mucous membrane at lower part of rear wall.

Therapy. Irrigations; instillations.

September 9th. Urination normal. Cystoscopy reveals only slight degree of hyperæmia near sphincter. Discharged *cured*, and referred to gynecological division.

CASE XXXV. *Hyperæmia (varices); retroflexio uteri*.—Frau W., aged forty-eight years; August 29th. Prolapsus vaginæ anterior, retroflexio uteri. Frequent urination; once during night. Tenesmus.

Urine. Normal.

Cystoscopy. Folds in mucous membrane at fundus. Bloodvessels in this region dilated. Mucous membrane otherwise normal. Declined treatment.

CASE XXXVI. *Anæmia; neurasthenia; pelvic neoplasm (?)*.—Frau G., aged forty-two years; September 7th. Extirpatio uteri (carcinoma) May 13, 1899. Urinates about every quarter of an hour during the day and one to three times during the night; preceded and followed by tenesmus.

Urine. Normal.

Cystoscopy. Mucous membrane entirely normal.

Therapy. General tonic treatment; distention of bladder.

September 23d. Steadily improving. Retains urine for two to three hours during the day. Urinates once during the night. Pain and tenesmus much less marked.

27th. Still under observation.

October 12th. Withdrew from treatment *improved*.

CASE XXXVII. *Hyperæmia; pericystitis*.—Frl. B., aged twenty-three years; September 7th. Ventrofixation, parametritis sinistra (large exudate). Urination every quarter of an hour during the day and three times during the night. Tenesmus. Frequent headaches; œdema of left leg.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum; rest of mucosa normal. At sphincter internus, insertion of instrument causes disproportionate amount of pain. Left-sided distortion. Declined treatment.

CASE XXXVIII. *Cystitis papillomatosa; pericystitis; retroflexio uteri*.—Frau T., aged thirty-six years; September 7th. Retroflexio uteri, perimetritis. Alternating periods of too frequent and normal urination. At present urinates abnormally frequently during the day,

passing only a few drops at a time. Act preceded and followed by tenesmus, and accompanied by cutting pain.

Urine. Normal.

Cystoscopy. Reveals a mass of tender, rosy-red, papilliform growth, extending over the floor of the bladder, from the sphincter almost up to the ligamentum interuretericum. These growths spring from a deeply congested mucous membrane, the area of inflammation extending considerably beyond the growths. The ureter catheter, laid upon this mass, sinks into it, and the individual papillæ stand out against it as delicate bodies, covered with apparently unbroken though dull-appearing mucous membrane. Growths bleed on slight touch.

Therapy. Irrigations and instillations.

September 12th. Improved; urination normal.

October 12th. Withdrew from treatment. Discharged *improved*.

CASE XXXIX. *Hyperæmia; retroflexio uteri*.—Frau U., aged fifty-six years; September 7th. Urinates every half hour. Tenesmus, and occasionally sharp pains.

Urine. Normal.

Cystoscopy. Mild hyperæmia at trigonum. Cervix uteri plainly visible, protruding into bladder. Declined treatment.

CASE XL. *Cystitis colli; pericystitis; endometritis hemorrhagica*.—Frl. H., aged twenty-six years; September 8th. Urinates every hour during the day; not during the night. Pain and tenesmus. Condition present since last year.

Urine. Normal.

Cystoscopy. Mild cystitis at trigonum. Folds in mucous membrane due to protrusion of cervix uteri. Referred to gynecological division for curettement.

CASE XLI. *Hyperæmia; pericystitis; epilepsy*.—Frl. W., aged twenty-seven years; September 8th. Parametritis retrahens, obstipation. Urinates hourly at times. At other times less often, but still more frequently than normal. Not during night.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum. Numerous extravescical strands, crossing and lifting up the bladder-walls.

Therapy. Distention and instillations; treatment of obstipation; massage of uterus.

September 12th. Retains urine for two hours. Typical epileptic attack.

14th. Improvement continues.

October 12th. Withdrew from treatment; discharged *improved*.

CASE XLII. *Perivesical neoplasm*.—Frau S., aged forty-three years; September 9th. Extirpation uteri (for neoplasm) March 28, 1899. Urinates hourly during the day; twice during the night. Act preceded by "burning." Condition, several weeks' duration.

Urine. Normal.

Cystoscopy. On the left side of the floor of the bladder is a protrusion (presumably an extravescical [parametrial] neoplasm), upon which are several smaller protruding masses. No inflammatory changes anywhere in the bladder. No indication for treatment.

CASE XLIII. *Cystitis colli; pericystitis*.—Frau L., aged twenty-three years; September 9th. Endometritis (post-abortum), parametritis retrahens, obstipation. Urinates every half-hour (sometimes oftener) during the day; formerly also during the night.

Urine. Slightly turbid (phosphates).

Cystoscopy. Mild cystitis at trigonum; pronounced pericystitic strands at the floor and lower part of the side and rear walls. On the right half of the ligamentum interuretericum, to the left of the ureteral orifice, is a small papilloma. Declined treatment.

CASE XLIV. *Hyperæmia; pregnancy.*—Frau V., aged twenty-nine years; September 12th. Pregnancy, perimetritis posteriora. Urinates every two hours during the day and two or three times during the night. Slight tenesmus. Condition antedates pregnancy.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum. Rest of mucosa normal. Uterus plainly visible. Declined treatment.

CASE XLV. *Varices; pericystitis; retroflexio uteri.*—Frau A., aged thirty-two years; September 13. Urination normal during the day; two to three times during the night.

Urine. Normal.

Cystoscopy. Bladder-walls, chiefly sides and rear wall, crossed by well-marked pericystitic strands. Vessels at fundus distended, and raised above surrounding mucous membrane. Not treated.

CASE XLVI. *Cystitis colli.*—Frl. S., aged twenty-two years; September 13. Salpingitis duplex. Urinates, or feels strong desire to, every two hours during the day, but not at night; tenesmus; possibly gonorrhœa two years ago.

Urine. Normal.

Cystoscopy. Mild cystitis at trigonum. Mucosa very tender, bleeding at the slightest touch.

Therapy. Irrigations and instillations.

September 21st. Urination normal.

25th and October 6th. Cystoscopy reveals normal bladder. Treatment discontinued.

12th. Condition normal; discharged cured.

CASE XLVII. *Hyperæmia; pericystitis.*—Frau K., aged thirty-three years; September 15th. Ventrofixatio, June, 1899. Urinates ten to twelve times during the day and three to four times during the night. Tenesmus, but no pain.

Urine. Normal.

Cystoscopy. Distinct bilateral distortion. Marked hyperæmia at trigonum. Distinct folds in mucous membrane of this region.

Therapy. Irrigations and instillations.

September 20th. Retains urine for two hours daily and all night. Tenesmus less marked.

23d. Frequency normal. Still some tenesmus. Urine normal.

27th. Following exposure after a bath, developed catarrhal rhinopharyngitis. Urinates every two hours during the day and once during the night since then.

October 12th. Still under treatment, improved.

CASE XLVIII. *Cystitis colli; pericystitis; retroflexio uteri.*—Frau Br., aged fifty years; September 22d. Catarrhal colitis; frequent urination during the day and once during the night; tenesmus, but no pain. Condition has existed for three or four years, but has become worse during the past year.

Urine. Normal.

Cystoscopy. Mild cystitis at trigonum, just within sphincteral orifice.

Surface of inflamed mucous membrane dotted with punctate hemorrhages. Cervix plainly visible. Bilateral distortion. Rest of bladder normal.

Therapy. Distention and instillations.

September 25th. Urination is less frequent and tenesmus not so marked.

October 12th. Still under observation, *improved.*

CASE XLIX. *Tuberculosis vesicæ (?)*—Frau G., aged thirty-four years; *September 23d.* Descensus vaginæ anteriora, phthisis pulmonalis. Urinates more frequently than normal during the day, and twice during the night. Pain, and preceded by tenesmus.

Urine. Normal.

Cystoscopy. Bladder walls normal, with the exception of an ulcer, somewhat larger than an almond, situated on the lower left posterior wall. Ulcer has grayish upper surface, irregular, clean-cut margins, and is surrounded by a very narrow margin of inflammation. Suspicion of vesical tuberculosis.

Declined treatment.

CASE L. *Hyperæmia; pericystitis; retroflexio fixata.*—Frau K., aged thirty-five years; *September 28th.* Urinates hourly during the day, but not at all at night; neither pain nor tenesmus.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum. Cervix plainly visible at the upper part of rear wall; several pericystitic strands. Declined treatment.

CASE LI. *Hyperæmia; pericystitis; retroflexio uteri.*—Frau W., aged thirty-seven years; *September 29th.* Endometritis dysmenorrhœica; neurasthenia. Frequent urination during the day, sometimes at quarter-hour intervals, and four to five times during the night. Tenesmus preceding and following the act.

Urine. Normal.

Cystoscopy. Hyperæmia at trigonum, extending from sphincter beyond ligamentum interuretericum. Cervix uteri plainly visible. Distinct bilateral distortion.

Therapy. Distention and instillations; massage of uterus.

October 2d. Since above has not had to urinate at all during the night; still ten to twelve times during the day. Tenesmus decreased.

12th. Continues to improve; still under treatment.

CASE LII. *Cystitis colli; hyperæmia.*—Frau K., aged twenty-five years; *October 2d.* Status post-abortion (still bleeding). For eight days urinates every half hour during the day, act being preceded by tenesmus. Need not urinate during the night; no pain.

Urine. Turbid (phosphates).

Cystoscopy. Hyperæmia at trigonum. At and about sphincter distinct cystitis. Several small coagula of blood on mucous membrane.

Therapy. Irrigations and instillations.

October 5th. Urination about normal; tenesmus decreased.

7th. All symptoms absent.

9th. Discharged cured.

CASE LIII. *Cystitis colli; pericystitis; retropositio uteri.*—Frl. K., aged eighteen years; *October 2d.* Constipation; urinates seven to eight times during the day; not during the night.

Urine. Normal.

Cystoscopy. Cystitis at trigonum, near sphincter; from this out, extending beyond ligamentum interuretericum, milder degree of inflammation; cervix plainly visible; bilateral distortion of bladder. Declined treatment.

CASE LIV. *Cystitis colli; pericystitis; hyperæmia.*—Frl. B., aged twenty-six years; October 3d. Urinates six to eight times during the day, and every two hours during the night; tenesmus; eight weeks' standing.

Urine. Turbid (phosphates).

Cystoscopy. Mild cystitis at trigonum, near sphincter; rest of trigonum hyperæmic. Light pericystitic strands over rear wall.

Therapy. Distention and instillations.

October 10th. Urinates every two hours during the day and once at night; still some tenesmus.

12th. Still under treatment; improved.

CASE LV. *Varices; retroflexio fixata.*—Frl. K., aged thirty-six years; October 4th. Urinates ten to twelve times during the day; not at night; no tenesmus; cutting pain; eight days' duration.

Urine. Normal.

Cystoscopy. Mild hyperæmia at trigonum; varices radiating from sphincter; cervix visible.

Therapy. Irrigations and instillations; massage of uterus.

October 6th. Some improvement.

12th. Still under treatment; improved.

CASE LVI. *Pericystitis; tubo-ovarian tumor; retroflexio fixata.*—Frau Sch., aged forty-one years; October 7th. Tumor of left side; urinates hourly during the day and twice at night, sometimes preceded by tenesmus.

Urine. Normal.

Cystoscopy. Mucous membrane normal. On the left side an extravescical tumefaction is plainly visible; cervix visible; pericystitic strands in cervical region. Referred for operation.

CASE LVII. *Varices; pericystitis.*—Frau H., aged fifty-three years; October 7th. Urinates abnormally frequently during the day, often with tenesmus. During the night once. Act accompanied by pain.

Urine. Normal.

Cystoscopy. Mild hyperæmia at trigonum. Vessels at sphincter varicose. Broad, plainly visible pericystitic strands.

Therapy. Distention.

October 12th. Reports considerable improvement. Still under treatment.

PROGNOSIS. This depends to a great extent upon the recognition and treatment not only of the local vesical changes, but also of those changes in other organs which are the remote cause. Although the condition is not dangerous to life, it may serve, through the non-recognition of its causative factors, as the means of origin for other and graver sequelæ, or it may last during the greater part of the woman's life. The duration depends upon the underlying cause. The best and quickest results are obtained in the cases of uncomplicated local cystitis, where in from a few days to a few weeks a complete cure may be expected. Pericystitic conditions and their resulting vesical changes are

usually far more resistant to treatment, though here, too, improvement is usually marked in a few days. In carcinoma and tuberculosis the prognosis is that of the parent condition. A marked tendency to recurrence of the condition has been spoken of by some authors. This tendency I believe to be due to the fact that they treated the *bladder symptoms only* without regard to the underlying causes.

In our own fifty-seven cases treated the results were as follows:

Discharged cured	.	.	.	.	.	.	.	13
Discharged improved	.	.	.	.	.	.	.	11
Not treated	.	.	.	.	.	.	.	25
Still under treatment, October 12, 1899	{						improved	8
							unchanged	0
								<hr/> 57

TREATMENT. This resolves itself into the treatment of the vesical changes and that of the underlying causes as previously stated. Pelvic changes must be treated, malpositions corrected, an attempt made to bring about the resorption of pelvic exudates, and to stretch old adhesions by massage; regular evacuations from the bowel induced, preferably by enemata, as cathartics tend to increase the vesical tenesmus; vulvar, vaginal, uterine, tubal, or ovarian changes and inflammations appropriately treated. With regard to diet, I have found it necessary only to forbid alcoholic beverages.

Urethral. Caruncles and condylomata are removed with the scissors and the base cauterized. Fissures are best treated in the endoscopic tube by cauterization with nitrate of silver. Catarrhal urethritis is treated by the direct application of astringent solutions; gonorrhoeal by applications of protargol, either in glycerin or water solution.

Vesical. Hyperæmia is locally treated by irrigations with a 1 per cent. solution of boric acid alone, or this is followed by the instillation of nitrate of silver solutions ($\frac{1}{4}$ to $\frac{1}{2}$ per cent.) as described. Cystitis is similarly treated, except that the solution of silver is stronger, the strength varying with the severity of the inflammation and the susceptibility of the patient from $\frac{1}{4}$ to 2 per cent. It is seldom necessary, however, to exceed 1 per cent. In addition, should there be more than isolated bacteria in the urine, one may give moderate doses of salol, boric acid, or urotropin. Personally, I prefer the last mentioned.

Pericystitis. The usual methods of massage employed to influence the connective-tissue strands resulting from the contraction of organized parametritic or perimetritic exudations expend their efforts upon those strands affecting the body of the uterus posteriorly and the adnexa. Those strands which occur anteriorly—the parts separating it from the bladder—are not treated, because they are not recognized. I have endeavored, and with some success, to remedy this omission, and to

stretch or massage these adhesions, as least so far as they affect the distensibility of the bladder, by means of artificial distention. For this purpose, after preliminary irrigation of the cavity, fluid is slowly injected by means of the large, graduated Janet hand syringe. Boric acid solution at or near body temperature is employed. As soon as the patient complains of a sensation of pain or tenesmus, which usually accompanies a distinct sense of resistance to injection, a short pause is made, when the symptoms usually quickly pass over. Then an additional quantity is gently injected. This goes on until the quantity is sufficiently great to cause the pressure or tenesmus to be marked or continuous. When the maximum quantity is reached the fluid is retained for about three minutes and then allowed to flow off until only a small quantity remains. This residue is left in order to prevent infection. The quantity is gradually increased as it becomes possible, and the sittings are repeated every second day. This method, which we have termed massage, or distention of the bladder, has given us excellent results with regard to the symptoms of vesical hyperæsthesia; what its final result will be, with regard to the disappearance of the strands, we are not as yet able to say, as our polyclinical patients, as is usually the case, tend to remain away as soon as some improvement is experienced.

Pregnancy. This requires local treatment of the complicating hyperæmia or cystitis only in the early months. Here I should advise against distention of the bladder. Where the symptoms remain after the termination of the pregnancy, I can see no objection to treatment being begun at the earliest possible period.

Cystocele, Malpositions and Diseases of the Uterus and Adnexa. Except for the local treatment of the bladder changes which may occur here, the treatment of these conditions belongs to the gynecologist.

Carcinoma. This is usually inoperable, as it involves the trigonum as a rule, and usually the ureters, with at times the urethra as well. Consequently, its treatment must be purely symptomatic. Local treatment is apt only to increase the sufferings of the patient.

Tuberculosis. Aside from the treatment of the general condition, which must be the first consideration, local treatment, varying from injections of nitrate of silver solution or iodoform emulsion to *sectio alta* with subsequent curettage, excision, or cauterization of the affected mucous membrane, has been advised (Güterbock); where the bladder symptoms have not gone beyond hyperæsthesia, nitrate of silver might be of use."

CONCLUSIONS. The conclusions which I have arrived at, as a result of this study, are briefly as follows:

1. The term "vesical hyperæsthesia" or "irritable bladder" is in almost every case in the female erroneously applied.

2. As a true *neurosis* vesical hyperæsthesia rarely occurs.

3. Where vesical hyperæsthesia exists it does so only as a symptom ; in the majority of cases as a direct result of some change in the vesical mucous membrane, in the minority as an indirect result of changes in other organs adjoining or near the bladder.

4. The diagnosis of the causative factor must rest upon a thorough examination not only of the bladder, but also of the urethra and genital and pelvic organs as well.

5. The treatment must be directed both against the local changes and the causative factors.

In conclusion, I desire to express my warmest thanks to my colleague, Dr. Richard Knorr, for permission to make use of the extensive material of his polyclinic, as well as for his most valuable help in conducting the gynecological examinations and treatment of our cases.

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REVIEWS.

CLINICAL EXAMINATION OF THE URINE AND URINARY DIAGNOSIS. By J. BERGEN OGDEN, M.D., Instructor in Chemistry, Harvard University Medical School, etc. Philadelphia: W. B. Saunders & Co., 1900.

THIS is a treatise of some four hundred pages, whose object, in the words of the author, is "to furnish the student and practitioner with a more complete clinical guide to urinary diagnosis than I have hitherto met with in a single volume." The book is divided into two parts: in the first part the subject is considered from the point of view of the urine, while in the second part the point of view is the disease itself. It is obvious that this arrangement effects a repetition, which is in many respects of advantage. Under the general consideration of albuminuria in Part I., for example, anæmia is given as one of the conditions in which albuminuria occurs; under the heading of Anæmia, in Part II., this fact is restated. This procedure is carried through the book, and there can be no doubt that this method is of pedagogic value. In the opinion of the reviewer, the chapters on Urinary Diagnosis should have been limited directly to urinary diagnosis, and should not have included physical diagnosis.

The volume presents a good general guide to the student and practitioner who seek practical aid and instruction. It is solid and conservative in tone, and will not teach the student to jump to conclusions in advance of our present knowledge. To the coworker in urinalysis the text seems somewhat matter-of-fact, and in places even dogmatic; but that style of diction was doubtless chosen in conformity with the pedagogic principles of the author.

The text contains not a few statements which we think appear to be partially or entirely at variance with our present knowledge. It also contains teachings which seem poor in policy or in principle, and in the choice of methods the author has not always, in the judgment of the reviewer, availed himself of the best at our disposal. The following illustrations will serve to elucidate these criticisms: On page 47, "In all degenerative changes in the liver, as in acute yellow atrophy, there is very low urea, it apparently being replaced by leucin and tyrosin." A much more probable explanation is that the leucin and tyrosin are the direct or indirect products of bacterial or enzymic action, and that the low production of urea is simply the result of the reduced metabolism of the liver. The methods advised for the quantitative estimation of urea are Liebig's, and the hypobromite and hypochlorite methods—all poor methods for either physiological or pathological urines. The decidedly superior method of Mörner-Sjöqvist is not mentioned. To the fundamental truth that a quantitative estimation of urea is almost worthless unless accompanied by determinations of the

total nitrogen in the diet, feces, and urine, there is no allusion. On pp. 65 and 66 it is stated that the uric acid is absolutely increased "by an abundant meat diet, especially when combined with a limited amount of out door exercise," "in diseases of the spleen," "in gout following the paroxysm," and that the uric acid is absolutely diminished "by low nitrogenous diet" and "in gout during the paroxysm." From personal experience as well as from reading the reviewer can state that a high meat diet does not necessarily cause an increased elimination of uric acid, nor does a low nitrogenous diet cause a diminution; it depends upon the kind of nitrogenous food—plain albumin has apparently little to do with the formation and elimination of uric acid, while the nucleo-proteids, animal or vegetable, affect it directly. Diseases of the spleen, apart from leukæmia, do not present a regular increase in the uric acid, and in gout the conditions are so complex and conflicting that our present knowledge will not allow of the unequivocal statement quoted. Why the Fokker-Salkowski method for the determination of uric acid, abandoned by Salkowski, is described and the Salkowski-Ludwig method omitted is difficult to understand. To the excellent Wörner method no reference is made. No method for the estimation of the purin bases is offered, nor is there any discussion of the relations to our general metabolism of the various substances belonging to this group. No method is described for the quantitative estimation of kreatinin. The precipitation of serum-globulin saturation with magnesium sulphate is much less satisfactory than is the use of an equal volume of a neutral saturated solution of ammonium sulphate, which, furthermore, does not seem to precipitate the albumoses. The differentiation of the albumoses from peptone is not described according to the most careful methods of Kühne and Neumeister. All of the references to peptonuria ought to have been included in the chapter on Albumosuria, the reviewer at least being acquainted with no case in which the true peptone of Kühne has been isolated from the urine. It is to be regretted that the work of the Jena school upon febrile albumosuria is not mentioned. Upon page 145 the statement is made that all the carbohydrates found in the urine contain either six atoms of carbon or a multiple thereof; that pentoses as well as hexoses occur in the urine is, however, well known. There is no gravimetric method for the estimation of glucose described, although by common consent these are, apart from Pflüger's modification of the Volhard titration method, the only reliably accurate methods; nor is the rapid and reliable clinical phenylhydrazin test of Neumann mentioned. On page 171 it is stated, upon the authority of v. Jaksch, that "the principal source of acetone is the decomposition of the proteids of the body as well as those taken as food." As a matter of fact, the best recent work has made it very probable that acetone is derived from the fats. On pages 175 and 176 it is stated that "a urine containing bile is always abnormally colored," and that a "bile-containing urine is always albuminous." A minimum trace of bile does not always give the urine an abnormal color, nor does such a urine always contain albumin or protein of any kind. For the separation of hæmatoporphorin the relatively crude method of Salkowski is described, while the simple and delicate method of Garrod is not mentioned.

It is to be deplored that the author has grouped "Ptomaines and Leucomaines—Toxicity of Urine" together, since thereby readers will

infer connections which have not been shown to exist. Except when ingested, ptomaines (which are not clearly defined and differentiated in this book) have only in the rarest cases been shown to have been active poisons in cases of sickness, and although some bacteria evolve ptomaines in the course of their life, our modern views of infection attach but little or no importance to them. The work of Griffiths is quoted without reservation or criticism, and readers will infer that his work is generally recognized, and that the substances he believes to have isolated play rôles in the symptomatology of the diseases under question. In truth, that work is of very doubtful value; our technical methods are not at all sufficient to warrant the inductions of Griffiths. It is quite certain that the leucomaines (a bad term, meaning the members of the uric acid and kreatinin groups) cannot be accurately defined as "those basic substances which are found in living tissues, either as the products of fermentative changes other than those of bacteria or of retrograde metamorphosis." That is taking science too far by the forelock. They are metabolic substances; they have never been reduced to fermentations; nor are there valid reasons for terming them products of retrograde metamorphosis in the sense in which that term is used in general pathology.

It seems to the reviewer that the scope of the book is too narrow. It is written too much from the stand-point of routine diagnosis and too little from the broad stand-point of the pathology of metabolism. There is too much routine statement of fact and too little bearing upon the why and the wherefore. Facts are, of course, the fundamental substratum of teaching, but for their full value most facts require interpretation. It is more important that the student should be taught to think than that he should be taught to remember. Misstatements occur in all books as a matter of course, and are easily corrected in subsequent editions, but the plan and scope of a book are not so easily altered. The scope of a book is, of course, the individual choice of the author, but the reviewer cannot forbear expressing the conviction that had an additional hundred pages been added to this excellent book, and those hundred pages devoted to the discussion of the pathology of metabolism, the worth of the treatise would have been appreciably enhanced.

A. E. T.

A DICTIONARY OF MEDICINE AND THE ALLIED SCIENCES. By ALEXANDER DUANE, M.D., Assistant Surgeon to the New York Ophthalmic and Aural Institute; Reviser of Medical Terms for Webster's *International Dictionary*. Third edition, enlarged and thoroughly revised. Pp. xi., 646. New York and Philadelphia: Lea Brothers & Co., 1900.

WHEN we consider that this work is intended to comprise "the pronunciation, derivation, and full explanation of medical, pharmaceutical, dental, and veterinary terms, together with much collateral descriptive matter, numerous tables, etc.," we appreciate the task which the author has set for himself and wonder how much of the "etc." can be gotten within the covers of this volume of moderate size. Thanks to the skill of the publishers, no unused space is found; owing to the terse and succinct style of the author, no words are wasted; consequently the

book contains a surprisingly large amount of information. While we presume the physician may need a larger work, the student of medicine is likely to find all that he may require, and for a desk companion, and we speak from personal experience, it is eminently satisfactory. Evidently much labor has been expended upon definitions; in general they are adequate. But the student of inquiring mind might not be altogether satisfied with that of "urotoxic coefficient," for instance. Or he might find that the book had omitted such reasonably common terms as "ester" and "aliphatic." When materia medica is reached and accuracy of terminology should be insisted upon, "arsenious," "acetanilide" and "stereoptene" will not meet with approval. The dictionary should conform to the *Pharmacopœia*. The definitions of "tubercular" and "tuberculous" ought to be made sharply distinct. Perhaps we are captious, but we believe the author would have rendered a real service had he defined "case" so that it would not be misapplied to the patient. Information is generally found where it is expected to be. An exception is "Quirica"—"Mal de los pintos," which does not appeal to one not understanding Spanish. "Pinta"—"See *Mal del pinto*." In a subhead under "Mal" a suitable definition is found. As for the cacophonous designations of new alleged remedies this, as well as all other dictionaries which have been published for more than a month, is inadequate, and properly so, but we have failed to find that many important synthetics have been omitted. We appreciate the remarkable industry and assiduous care of the author, and if renown results from the making of a dictionary he should be included among those who have attained success. R. W. W.

A MEMOIR OF HENRY JACOB BIGELOW, A.M., M.D., LL.D., Emeritus Professor of Surgery in Harvard University, etc. Pp. 297. Boston: Little, Brown & Co., 1900.

SURGICAL ANÆSTHESIA, ADDRESSES AND OTHER PAPERS. By HENRY JACOB BIGELOW, A.M., M.D., LL.D., Emeritus Professor of Surgery in Harvard University, etc. Pp. 378. Boston: Little, Brown, & Co., 1900.

ORTHOPEDIC SURGERY AND OTHER MEDICAL PAPERS. By HENRY JACOB BIGELOW, A.M., M.D., LL.D., Emeritus Professor of Surgery in Harvard University, etc. Pp. 373. Boston: Little, Brown & Co., 1900.

THE MECHANISM OF DISLOCATIONS AND FRACTURES OF THE HIP; LITHOLAPAXY; OR, RAPID LITHOTRITY WITH EVACUATION. By HENRY JACOB BIGELOW, A.M., M.D., LL.D., Emeritus Professor of Surgery in Harvard University, etc. Pp. 356. Boston: Little, Brown & Co., 1900.

THESE four volumes comprise various memoirs and biographical sketches of the late Dr. Henry Jacob Bigelow, together with his complete writings.

The first volume contains an elaborate biographical sketch of about one hundred and eighty pages; following this is a memoir by the late Oliver Wendell Holmes of fourteen pages; also one by Dr. Reginald H. Fitz, and another by Dr. A. T. Cabot. Then comes a list of Dr.

Bigelow's contributions to medical literature. This embraces fifty-seven titles. The remaining sixty-four pages are composed of various obituary and other notices of six medical societies and institutions, four medical journals, and six daily papers. The volume gives an interesting account of the antecedents and life of Dr. Bigelow. It describes his surroundings, education, and general work, and is replete with incidents. Dr. Bigelow's grandfather was a clergyman. His father, Jacob Bigelow, was Professor of *Materia Medica* in the Medical School of Harvard for fifty years, and for eleven of those years was Rumford Professor of the Application of Science to the Useful Arts in the academic department. He was a graduate of the medical department of the University of Pennsylvania and the author of various scientific works. He was said to have been a born artificer, mechanic and inventor, familiar with the work and methods of every sort of handicraft. It is thus seen that Dr. Bigelow received by legitimate inheritance his great natural abilities both mental and physical. It is stated that his father was not rich. It may be that Dr. Bigelow owed his greatness at least in part to this fact. The children of rich parents, be they ever so talented, rarely rise to a great height in science and art. They not infrequently start out well, and work diligently, but cease before much has been accomplished. Poverty is too big a handicap for any but the exceptionally strong to overcome, but Dr. Bigelow was fortunate in being so situated as not to be hampered by a lack of means and not spoiled by a superfluity, and he is a marked example of the position to which one so placed may attain if he possesses both perseverance and ability. He was an indefatigable worker and earnest in everything. Dr. Cabot, in his memoir, states that he was a brilliant operator, bold and keen, full of expedient, going directly to the object sought, with no fumbling of mind or hand. To see him perform litholapaxy was a liberal education in that branch of surgery. He took his medical degree in Harvard University in 1841, and eight years later was made Professor of Surgery, which position he held for thirty-three years. He was evidently one of those favored mortals who achieve success early in their career, and who continue to be successful afterward. He lived to the age of seventy-two years. He was evidently in the highest degree practical, not loving literature for literature's sake, but for the material it furnished him to solve the problems with which he was ever occupied. He was too busy in furnishing the world with new ideas to waste time in presenting those of other people. Oliver Wendell Holmes said he opened a book as he would a jack-knife, to use it for some special purpose, which, having accomplished, he shut it up and had done with it. He was brilliant and able, and took much interest in medical education. He contributed greatly to the placing of the medical department of Harvard University in the high position it now holds.

The second volume contains several papers on anæsthesia and various anæsthetics, with an address on medical science and art, and others on medical education in America, science and success, and mind and matter.

The third volume contains his Boylston Prize dissertation on orthopedic surgery. It is now of course out of date, but is interesting for historical reasons. In it tenotomy for strabismus is included under orthopedic operations. This volume also contains the records of the famous tamping-bar case, in which an iron bar three feet and a half

long, and weighing more than thirteen pounds, was driven through a man's skull and brain without a fatal result.

The last volume contains Dr. Bigelow's most valuable contributions to surgery. In it are given his publications on rapid lithotomy with evacuation, and his work on the hip, embracing the mechanism of dislocations of the hip and the mechanism of fractures of the neck of the femur. This last work on the hip was issued several years ago as a small volume. It is now out of print. The work is printed in handsome style, with uncut edges and gilt top, and is a credit to the compiler. While some of the subjects here reproduced have lost their previous importance, others are still valuable. From an historical point of view they will be eagerly read by those who take an interest in the history of medical science and art. The profession is under obligations to Dr. Bigelow's son, Dr. William Sturgis Bigelow, for this publication of the memoir of his father and the reissue of his works.

The biographical account will appeal to many. It is both pleasurable and profitable to hear how our eminent predecessors achieved their greatness. It gives us an opportunity to profit by their experiences as well as to pass an agreeable hour which might otherwise be wasted. Many of the other papers have not lost their interest. The questions of medical education and hospital management which he discussed have not even yet been definitely settled, and his work on the luxations and fractures of the hip possesses a renewed interest in view of the recent researches of Dr. Oscar H. Allis. This republication will place it within reach of many who otherwise would be unable to obtain it, since it has been long out of print. In the present day, when we—particularly if we are young—so complacently congratulate ourselves on being so far in advance of our fathers, it will be particularly fitting to review these four volumes.

It may perhaps extinguish some of our conceit, but it will stimulate us to emulate the example of one who with much smaller opportunities and facilities than we possess achieved such noble results. G. G. D.

A MANUAL OF PERSONAL HYGIENE. Edited by WALTER L. PYLE, A.M., M.D., Assistant Surgeon to Wills Eye Hospital, Philadelphia; Fellow of the American Academy of Medicine, etc. Pp. viii., 334. Philadelphia: W. B. Saunders & Co., 1900.

In this work the editor, who has written on the subject "Hygiene of the Eye," has been assisted by the following contributors: "Hygiene of the Digestive Apparatus," Charles G. Stockton, M.D.; "The Skin and Its Appendages," George Howard Fox, M.D.; "The Vocal and Respiratory Apparatus," E. Fletcher Ingalls, M.D.; "The Ear," B. Alexander Randall, M.D.; "Physical Exercise," G. N. Stewart, M.D., and "The Brain and Nervous System," J. W. Courtney, M.D.; the last name does not, however, appear on the title-page. To present this subject in a manner which shall appeal to the educated layman without pandering to popular prejudice or fads, is by no means an easy matter. To offer neither too much nor too little and to make all clear and distinct involve careful discrimination. To say that all of the contributors have attained equal success would be to assume that the

impossible has been reached, but it can be fairly stated that in the generally excellent presentation no chapter is even inadequate. Some topics which were the especial delight of the audience which listened to our old master Bouchardat have been very properly omitted, and for that reason the work can safely be placed in the hands of the young and presumably curious. Deserving of especial commendation is the work of Pyle, Stockton, Fox, and Stewart. Of minor points worthy of mention are the work of Whitman on shoes, which is quoted; the pithy and just presentation of the status of refracting opticians, and the very sensible remarks about earache. Inaccurate statements are rare; those concerning starch conversion (pp. 11 and 12) need to be modified in view of the work of Kellogg. Literary accidents, as the following—"examinations of the eyes under drops for glasses" (pp. 177 and 178), "Bruner" for Brunner" (p. 14), and "tubercular" when tuberculous is probably intended, are slight and infrequent blemishes. Taken as a whole, we regard this book as a successful presentation of a difficult subject and one well adapted for the purpose for which it is intended.

R. W. W.

DISEASES OF THE EYE. By EDWARD NETTLESHIP, F.R.C.S., Ophthalmic Surgeon at St. Thomas' Hospital, London. Revised and edited by WILLIAM CAMPBELL POSEY, A.B., M.D., Ophthalmic Surgeon to the Howard and Epileptic Hospitals, Philadelphia. Sixth American from Sixth English Edition. With a Supplement on Examinations for Color-blindness and Acuity of Vision and Hearing, by WILLIAM THOMSON, Emeritus Professor of Ophthalmology in the Jefferson Medical College of Philadelphia. With 5 colored plates and 192 engravings. Philadelphia and New York: Lea Brothers & Co., 1900.

THE good qualities that have secured the pronounced and prolonged success of Nettleship's work have been discussed in reviewing a preceding edition. It suffices here to say that they continue to characterize it, and to notice the additions that have been made in the present edition. These additions add some thirty-two pages to the size of the book. The most striking of them are three colored plates representing common ophthalmoscopic appearances, and some thirty well-selected engravings.

Considerable changes have been made in the arrangement of the chapter on External Examination of the Eye, and some new matter has been added. The chapter on Diseases of the Conjunctiva deals somewhat more at length with the bacterial causes of conjunctivitis than it has done in former editions. But it fails to mention the diplobacillus conjunctivitis, first described by Morax and Axenfeld, or its treatment by zinc sulphate, the contribution which is probably of the greatest practical importance which bacteriology has yet made in this field.

The supplement on the practical examination of railway employés, by Dr. Thomson, has been thoroughly revised, and constitutes an authoritative manual for those engaging in this work. In the appendix we find introduced for the first time the requirements of candidates for admission to the public service in the United States, and a description of a good method for examining the eyes of scholars in the public schools.

E. J.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
WILLIAM OSLER, M.D.,
PROFESSOR OF MEDICINE IN THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND,
AND
GEORGE DOCK, M.D.,
PROFESSOR OF MEDICINE IN THE UNIVERSITY OF MICHIGAN.

Clinical Lectures on Circulatory Affections—Lecture I. Persistence of the Arterial Duct and its Diagnosis.—According to GIBSON (*Edinburgh Medical Journal*, July, 1890, p. 1), the ductus arteriosus ought to be, and usually is, entirely obliterated within eight days at latest from the date of birth. In a small percentage of individuals this communication persists throughout life. The purpose of the lecture was, in part, to impress on his students the definite nature of the physical signs in uncomplicated cases of patent ductus arteriosus, the diagnosis of which appears in his eyes almost as exact as the solution of a mathematical problem. A further object was to reply to certain criticisms which had been made on his work on *Diseases of the Heart and Aorta*, in which he was charged with placing too much reliance on murmurs without due consideration of the pathological changes in the heart and the resulting mechanical disturbances.

Gibson states that owing to the higher pressure of the blood in the aorta as compared with that in the pulmonary artery there must be a current from the former to the latter, and this stream will be almost, if not quite, continuous. The velocity will be greatest during and immediately after the ventricular systole when the blood-pressure in the aorta is highest, gradually diminishing as the pressure in the two vessels becomes more nearly equal during the period of repose. From this he concludes that it would be natural to expect that, as evidence of patent ductus arteriosus, there will be a long murmur, beginning a little after the commencement of the first sound, filling up the short pause, and continuing beyond the second sound. The murmur is almost invariably accompanied by a well-marked thrill. The murmur and thrill are best heard and felt in the second or third left intercostal space, just outside of or inferior to the conventional

pulmonary area. Contrary to what is usually the case in congenital heart lesions, cyanosis and clubbing of the fingers do not occur.

Five cases have come under Gibson's observation during the last few years. One of these he reports in detail, to substantiate his statement that cases of uncomplicated patent ductus arteriosus can be readily diagnosed. The main points in this case were as follows: The patient was a woman, aged thirty-one years. There was nothing of importance in the family history. She had always been subject to palpitation on exertion or excitement. There was no clubbing of the fingers, but a slight bluish color to the lips. The pulse was usually regular and equal in force and rhythm. There was slight bulging of the second, third, and fourth left costal cartilages, especially the second, close to the sternum. The point of maximum cardiac impulse was in the fifth interspace three and a half inches from the sternum. The right border of the heart reached one and a half inches and the left four and a half inches from the midsternum. There was a thrill over the base of the heart. It was felt with greatest intensity in the third left intercostal space, two and a half inches from the midsternum. It began shortly after the apical impulse and continued almost to the next apex beat. The shock of the pulmonary second sound could be distinctly felt during its continuance. At the base of the heart an almost continuous rushing murmur, beginning shortly after the first sound, which was clear at its commencement, and continuing almost to the beginning of the next first sound, was heard. It had its maximum intensity in the third left interspace, about two and a half inches from the mid-sternal line, but was heard all over the base of the heart. The second sound was heard distinctly in the middle of this murmur; it was distinctly accentuated and sometimes doubled. The sounds at the other areas were all audible, some being more obscured than others by the transmitted murmur.

With a thrill and murmur beginning after the first sound and continuing until after the end of the second sound, there was no possibility entertained in Gibson's mind that the physical signs were due to an alveolar lesion. It seemed to him that no other diagnosis was possible than patency of the ductus arteriosus.

The patient at a subsequent date was admitted with acute lobar pneumonia, from which she eventually died. An autopsy was obtained and Gibson's diagnosis of patent arterial duct was substantiated. The ductus was so short that at first sight it seemed as if the left pulmonary artery was actually adherent to the aorta. The duct admitted a No. 12 to 14 bougie. There were no abnormal communications between the various heart cavities. The various valves were normal; the tricuspid orifice was dilated, however. The right ventricle was dilated and hypertrophied, the wall measuring three-sixteenths of an inch in thickness.

Gibson states that this case shows that in certain instances the diagnosis must in large part be made "from the stand-point of clinical observation, instead of from the consideration of the pathological changes in the heart and the resulting mechanical disturbances."

The writer sums up the essential facts upon which the diagnosis of persistent ductus arteriosus may be made with perfect confidence as follows:

There may be no dyspnoea, cyanosis, œdema, or other evidence of disturbance of the general circulation. Inspection may fail to show anything of importance. Palpation usually reveals the long thrill following the apical impulse and persisting beyond the recoil of the blood on the semilunar cusps, which may be felt during the thrill. Percussion may not show any enlargement of the heart. Auscultation gives convincing evidence of the lesion in a murmur which may be regarded as almost pathognomonic. Beginning distinctly after the first sound, it accompanies the latter part of that sound, which may be accentuated in the pulmonary area, or may be, and often is, doubled, and finally dies away during the long pause. This murmur is best heard in the second or third left intercostal spaces.

Concerning the Cause of the Tolerance to Morphine.—According to FAUST, the tolerance of the organism to increasing doses of morphine might appear to be possible of explanation in two ways:

1. It may be due to a dulling of the nervous system against the action of the drug, so that given doses eventually may not have as marked an effect as at first. Such an effect would be expected to occur only after large doses.
2. The organism gradually comes to possess the power of rendering the morphine ineffectual by transforming or destroying it.

By experimentation on dogs with increasing doses of the drug he comes to the conclusion that the latter explanation is apparently the correct one. He finds that under normal conditions a portion of the morphine injected subcutaneously or intravenously is transformed in the body tissues. After a single dose of morphine, sufficient to produce definite poisonous symptoms in dogs, he was able to obtain only about 70 per cent. of the amount injected. By gradually increasing the size of the injected dose a stage is reached when not a particle of morphine is recoverable in the feces or urine. Further, an analysis of the various organs fails to show the presence of any morphine. During the experiments the reduction in the percentage of recoverable morphine in the feces was gradual, until eventually none was found.

Faust concludes from his investigations that the tolerance of the organism to morphine is due not to a tolerance or a dulling of the tissues to the effect of the drug, but rather to the increasing power which the tissues come to possess to transform and destroy the alkaloid and thus render it inactive.—*Ueber die Ursachen der Gewöhnung an Morphin.* Edwin Stanton Faust. Leipzig: Druck von J. B. Hirschfeld, 1900.

Change in the Pathology of Influenza.—WASSERMANN (*Deutsche med. Wochenschrift*, 1900, No. 28) calls attention to some observations made in the Institute for Infectious Diseases, according to which, in the influenza cases with pneumonia observed last year, the influenza bacilli were found in very scanty numbers, and soon disappeared. Notwithstanding this, severe toxic symptoms followed on the part of the heart, muscles, and lungs, even going on to death from heart-failure. The author suggests the important and plausible explanation that in these cases partial immunity from previous infection exists in the body. This does not prevent the germs from developing, but does cause them to break down rapidly. Their toxic substances are thus set free, with the dangerous results now reported. Wasser-

mann also believes that the conditions are now becoming favorable for a new and great epidemic of influenza.

CLEMENS (*Münch. med. Wochenschrift*, 1900, No. 27) calls attention to the relative rarity of cases in which the influenza bacillus can be demonstrated, the proportion being less than in earlier epidemics. The diagnosis of a single case, therefore, cannot be made to depend on the sputum examination, though in all epidemic catarrhs the Pfeiffer bacillus should be carefully looked for, in order to make a positive diagnosis. In the latest Freiburg epidemic the type of disease was chiefly pneumonic. The pure toxic, the gastro-intestinal, nervous, and neuralgic forms were lacking, but there were cases of bronchopneumonia, with slight local signs, scanty sputum containing large numbers of epithelial cells, and having a febrile course of from four to six or eight weeks.

Enlarged Superficial Glands in Abdominal Carcinoma.—TARCHETTI (*Deutsches Archiv für klin. Med.*, Band lxvii., p. 574) reports the case of a patient with cancer of the pancreas, in which the diagnosis was assisted by the finding of enlarged lymphatics in the neck. The author was led to investigate the literature of the subject, which shows great diversity of opinion. Pending further investigation, the author gives the following as a statement of the present condition: Swelling of the glands in the left superclavicular region is not frequent in cancer of the abdominal organs, but is not so rare that it should be neglected in doubtful cases. Such enlargement is not confined to cases of cancer of the stomach, but occurs with cancer of the duodenum, liver, and perhaps other organs, without necessary involvement of the stomach. The swelling may be observed long before death, and often at such a time as to be of diagnostic assistance. Metastases in the supraclavicular glands furnish a rather characteristic clinical picture, which can be recognized without histological examination—i. e., by their large size, making them easy to feel and, often, to see, and their seat, immediately above the clavicle, almost always on the left side.

The Percussion of the Lung and Spleen Boundary.—BUTTERSACK (*Zeitschrift für klin. Med.*, Band xl., p. 244) calls attention to a small but important detail in the physical examination of the spleen. This consists in percussing the splenic dulness in full inspiration and full expiration. In both the spleen is close to the lung, and gives a sharper differentiation, as compared with the lung resonance, than is obtained if percussion is done during breathing, when the complementary space is partially filled. One important feature is that percussion be made slowly and gently. The position of the patient is relatively unimportant when this method is followed.

Diabetes Mellitus, Abdominal Colic, and Oedema.—EBSTEIN (*Zeitschrift für klin. Med.*, Band xl., p. 181) has made an interesting study of a case showing the above conditions. A man, aged thirty-seven years, had frequent and severe attacks of colic for four years. Toward the end of the period sugar was found in the urine in one of the attacks, never having been looked for previously. Later, alimentary glycosuria developed, passing on to severe diabetes after severe emotional strain, with extensive oedema

occurring paroxysmally without albuminuria. Ebstein discusses the colic, with critical reference to the literature, showing the uncertain relation of gallstone colic and glycosuria, the difficulties in the diagnosis of pancreatic colic, and suggesting that in his own case the colic may have been one of the not unusual visceral neuralgias of diabetes. He concluded that uncomplicated biliary colic cannot cause glycosuria.

As regards the œdema, in the case reported this was characterized by the rapidity with which it spread over the lower extremities and external genitals, less intensely in the upper part of the body and the face, and the quickness with which it disappeared, especially under the influence of diuretic and diaphoretic treatment. The examination of the heart gave no explanation of the œdema; there was no congestion, no cachexia, nor hydræmia. After the œdema subsided there was an erythematous flush on the skin and a feeling of soreness. The author was, therefore, led to think of an œdema due to nervous influence, perhaps by the action of a toxic substance.

Chemical Changes in the Blood in Pernicious Anæmia.—ERBEN (*Zeitschrift für klin. Med.*, Band xl., p. 266) reports some investigations made in a case of pernicious anæmia. He found: 1. That the albumin is diminished, due to a decrease of the serum-albumin and the great reduction (to one-fourth of the normal by weight) of the red corpuscles. The individual red cells are hypertrophied and their albumin increased. 2. Among the various albuminous bodies the fibrin is absolutely diminished, but relatively normal, the albumin almost normal, the serum-globulin much reduced, so that almost all the loss is due to it. The author suggests that this loss is related to the progressive diminution of the red corpuscles, the appearance of derivatives of the hæmoglobin, the relative increase of lecithin, and the frequently associated atrophy of the intestinal mucosa. There may, indeed, be a causal relation in the failure of the organism, or the intestinal mucosa, to form globulins. 3. The water is increased, both in the serum and erythrocytes. The hypertrophic red cells are swollen. 4. Fat is present in normal amount, cholesterin greatly diminished, though the latter is still present in the red corpuscles in proportion to their organic matter. Lecithin is diminished in the serum, but increased in the red cells. 5. The watery extractives are diminished in the whole blood and the serum, the alcoholic extractives increased in both; but in the red cells both extractives are increased. 6. The ash is increased. 7. In the ash Na_2O and Cl are increased (no doubt as the result of hydræmia); CaO and MgO increased (as the result of destruction of bone, according to the author), K_2O and P_2O_5 lessened, though the red corpuscles contain more of the latter, the serum more of the former than normal. Iron is lessened, on the whole, though the serum contains it and the red cells show an excess. From the relations of the iron to the hæmoglobin it seems that in pernicious anæmia either the hæmoglobin is richer in iron than normal or the red cells contain iron in some other form. Perhaps both possibilities are true.

Post typhoid Suppuration of the Thyroid Gland.—SCHUDMAK and VLACHOS (*Wiener klin. Wochenschrift*, 1900, No. 29) report the case of a

man, aged thirty years, who began to notice tenderness in the previously slightly enlarged thyroid gland about a month after the beginning of typhoid fever, and before the temperature and the splenic dulness became normal. Next day the leucocytes, which were before that subnormal in number, with lymphocytes increased, rose to 8800. The tenderness in the thyroid increased; the gland became larger, the skin over it red, and in three days the leucocytes numbered 13,100, with polynuclears 75 per cent. By the end of a week the tumor showed slight fluctuation, and aspiration revealed pus, from which typhoid bacilli were cultivated. The abscess was then incised and drained. Healing followed without incident. Examination of the blood and urine failed to show typhoid bacilli in those fluids.

The authors were led by this case to investigate the relation of typhoid bacilli to the leucocytes and suppuration, and from their experiments on rabbits, along with a critical study of the literature, they concluded that: 1. Typhoid bacilli are pyogenic, independent of their virulence, with the exception of the most virulent forms, which act too rapidly to permit pus formation. 2. Leucopœnia in typhoid fever appears to be the result of the localization of the disease in the chief sites of leucocyte formation, and does not depend on the virulence of the germs, for the latter, growing in the periphery, cause suppuration.

Congenital Hypoplasia (Aplasia) of the Nerve Centres.—HEUBNER (*Berliner klinische Wochenschrift*, 1900, No. 22) reports the case of a child, aged one and a half years, whose face was noticed to be unsymmetrical at birth, and so persisted. The family history was good; the child differed from its brothers less in its mental aspects than in such functions as sitting, standing, walking, and talking. It was less communicative than the others, but understood well, reacted normally, and its psychic condition was as good as could be expected. Examination revealed complete paralysis of the left facial and weakness of the right facial region; diminished mobility of the muscles innervated by the left oculomotor; complete paralysis, with marked atrophy, of the left half of the tongue, and rather weak muscles in the right half; absence of secretion of tears. The electric reactions were abolished in the paralyzed areas. Observed more than a month, the child showed no change. The patient then died of pneumonia after measles, and the author was able to confirm the suggestion of Moebius, which has hitherto been impossible. The brain, central ganglia, cerebellum, and cord showed no abnormality, either gross or by the methods of Weigert-Pal and Marchi, though the cord in general seemed somewhat less developed than its age would indicate. In the medulla, however, the left half was much narrower, shorter, and thinner than the right, and the changes could be followed through the pons and to the corpora quadrigemina. Microscopical examination made it evident that there was no degeneration, but a hypoplasia, affecting not only the olivary body but also the motor nuclei corresponding to the areas affected during life. The left hypoglossus and both abducens nuclei were completely absent, while the right hypoglossus and facial nuclei were present, but smaller than usual. The trochlear nuclei were well developed, and most of the oculomotor. Moreover, the posterior longitudinal tract was absent at the levels of the trochlear and right oculomotor nuclei; below the left oculomotor it

was rudimentary, but below the trochlear absent. There were fewer fibres than usual in the left reticular substance, especially its dorsal third. All the sensory nuclei were well formed. The tongue showed no atrophy, but a simple muscular defect, corresponding to the absence of degenerative changes in the nerves. Moebius supposed that such defects were due to destruction of nerve tissue by some irritant (or infection) from the mother during foetal life; but in this case there was no evidence of such a process.

In the discussion of this case Oppenheim (*loc. cit.*, p. 492) reported a case of congenital unilateral ptosis with an anomaly in the roof of the aqueduct of Sylvius, causing a sort of double bridge, lined by ependyma cells continuous with those of the ventricles.

SURGERY.

UNDER THE CHARGE OF

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Disinfection of the Hands.—SARWEY (*Cent. für Chir.*, 1900, No. 28) showed by his experimental research, reported to the German Surgical Congress, that many of the methods now employed for disinfecting the hands before surgical operations are very defective. The reason for this conclusion is that he finds that the methods employed in making the bacteriological tests have been defective in their technique. In particular the method of obtaining the cultures from the hands after the sterilization has been attempted have been inefficient and inaccurate. The most efficient method, and the one which he has employed in testing the methods of disinfection, is as follows:

The palmar and dorsal surfaces of the hands are scraped with sterilized pieces of hard wood. The periungual spaces are cleaned in a similar manner. The wood is then placed in a test-tube and shaken for five minutes in a little sterile water. This water is then poured on the agar-agar culture plates. This method is the most searching and accurate, and has shown that the hot water and alcohol method and the ethereal soap method are not capable of disinfecting the hands, though they decrease the number of bacterial colonies in about equal proportions. The same is true of other methods.

VOLLBRECHT (*Ibid.*) described a hard form of ethereal soap which he employs without water. The soap is placed on a sterile scrub-brush and rubbed into the hands vigorously for five minutes. The alcohol is in this manner

rubbed into the skin while there is so little soap remaining that the skin is not slippery and instruments can be readily handled. No lather is formed as no water is used. The skin is not irritated. In the discussion which followed the opinion was clearly in unison with the results obtained by Sarwey, and the impossibility of absolute sterilization was conceded, while the use of rubber gloves was commended.

KRÖNIG (*Ibid.*) in the discussion reported the results which he had obtained, in collaboration with Blumberg, in studying the efficiency of various methods of sterilizing the hands. Their results agreed with those of Sarwey in that they found the methods generally employed were not efficient. Their method of studying, however, differed. They infected the hands with a particular bacillus in order to be certain that they were dealing with one which was sure to develop on the culture media employed, and did not trust to such bacteria as might chance to be on the hands for their experiment. Their results showed that the method which produced the greatest sterilization was the employment of hot water and alcohol. The hands were washed for five minutes with soap and hot water with the use of the brush. Then for five minutes with alcohol and the brush. In addition they found that if to this mechanical method of disinfection a chemical was added the results were more nearly perfect.

The best results were obtained by employing a new mercurial salt, äthylendiamin. This salt has the peculiar advantage that it can be used in a 1 per cent. solution upon the hands without producing irritation. This is a very valuable property of this salt, and makes it especially valuable where there is marked infection. They employ it in their clinical work in a 1 to 300 solution, and have been extremely gratified with the results and the freedom from irritation.

Radiography in the Study of Fractures and Luxations.—MAUNOURY (*Thirteenth Int. Med. Congress Résumé*, August, 1900) says that radiography is reopening the study of fractures and luxations. In vain attempts have been made to discredit its value. The errors that have been made are to be imputed not to the method but to the poor interpretation of the data it furnishes. To avoid this precise methods should be employed, as, for example, marking on the plate the point at which the tube is vertical. In cases of fracture this method is valuable in diagnosis and as well in treatment. In diagnosis the service rendered is incomparable. It points out the number of fragments, their form, position, and extent of overlapping which corresponds with the amount of shortening. The displacement in different directions and the location of the sharp angles are also shown. It is necessary to make two observations at different angles, or a stereoscopic picture can be secured. The exact angle and position differ, however, with each fracture. Ordinary clinical methods have their former value, but this method adds precision and certainty, even where the lesion is complex and the soft tissues greatly swollen. Finally, it is less painful and decreases to the minimum exploratory movements that injure the tissues.

The radiograph is valuable in all cases of fracture. He especially notes the fractures of the head of the humerus, which explain the roughenings and ankylosis so frequently attributed to periarticular inflammation; the

fractures of the inferior extremity of the radius which frequently accompany lesions of the carpus; the fractures of the leg, notably those involving the tibio-tarsine articulation. In these this method is the only one capable of demonstrating exactly the relations between the astragalus and the tibio-fibular mortise, an essential element in their proper treatment; fractures of the astragalus are not as rare as they were supposed to be, and metatarsal fractures are more readily detected and explained.

The study of the formation and function of callus is very interesting and instructive. The formation of callus varies with the size of the bone, taking longer in the larger bones. It may remain invisible to the radiograph even after solid union is present; this is especially common in oblique fractures of the tibia. Pathological variations in the formation of callus can also be studied by this method.

In treatment this method is as useful as in diagnosis. It is possible to view the reduction and to determine when it is sufficient. The examination can be repeated at any time during the treatment, and any defect in position corrected. Finally, consolidation can be determined by this examination. The effect of various forms of treatment and fixation apparatus can be studied. Perfection of form has been found not to be indispensable to functional usefulness. In fractures entering joints the detail furnished by this method is particularly valuable, permitting perfect re-establishment of the joint. It is valuable in determining where operation is essential.

VON BERGMANN (*Ibid.*) points to the fact that the increased knowledge of fractures has led to progress in two directions: the one the treatment of certain simple fractures by open operation; the other, the diagnosis of the exact character of the fracture and the extension of pathological knowledge regarding osseous lesions which the Röntgen method has secured.

The interposition of a muscle between the fragments is supposed to be a cause of non-union; it is, however, impossible to demonstrate this fact, although we may see the fragments separated and displaced, and that manipulation does not bring them closer. There are other reasons for non-union and the separation of the fragments as seen in fractures of the small bones, as, for example, the patella.

The exploration of these fractures by the Röntgen ray shows these obstacles to union: 1. The inequality of the two fragments; the upper fragment is much larger than the lower, and will not be held in contact except by a suture. 2. The comminution of the bone into multiple fragments; the small pieces or splinters fall between the larger and prevent coaptation and union. 3. One of the fragments is displaced with rotation in such a manner that the fracture-surface of the other fragment is in contact with its entire surface, the rough surfaces cannot come into apposition and unite. All these complications can be observed by the Röntgen method and the complication corrected by operation. The author has had twenty-five cases of this character, in all of which complete bony union was obtained. The examination by this method demonstrated the result of the operation, showed the bone uniting the fragments and the metal wires used in suturing them.

Fractures of the lower end of the radius should probably be placed in the operative category with those of the patella, and undoubtedly better results would be obtained in many instances.

Fractures of the metatarsus and of the bones of the tarsus were almost unknown before the advent of this method of observation. They were mistaken for bad bruises or sprains and were treated by massage, which augmented the displacement. When they are determined the foot should be immobilized.

The Operative Treatment of Dupuytren's Contraction.—LOTHEISEN (*Cent. für Chir.*, July 28, 1900) describes a new method for correcting this deformity. Massage combined with subcutaneous section may produce good results in mild cases, but in the more aggravated, subcutaneous incisions only adds scar-tissue, which finally takes on excessive pathological contraction and increases rather than decreases the deformity.

He advocates and has successfully employed an incision which extends from the metacarpo-phalangeal joint along the ulnar border of the hand and then crosses over the lower border of the palm. The skin can be dissected from the palmar aponeurosis in which the pathological process is found, and it in turn can be dissected free from the tendons that lie beneath. The pathological cause of the disease is thus removed completely, and the hand can be stretched out. There may result a slight defect in the line of the transverse incision, but with massage and careful treatment the complete function of the hand can be restored.

Pancreatic Surgery.—ROBSON (*Thirteenth Int. Med. Congress Résumé*, Paris, August, 1900) believes that pancreatic affections are much more common than is usually thought. He bases this opinion on forty cases in which he operated and many others that have come under his observation. Posterior drainage is important in acute and suppurative pancreatitis where practicable. For reaching the main pancreatic duct he has found it practicable to incise the second part of the duodenum and lay open the termination of the duct from the papilla.

Fifty cases of cancer were found to occur in persons over forty years of age. He believes that the cases occurring earlier in life are in many instances chronic interstitial pancreatitis, which may resemble cancer not only in the symptoms, but to the naked eye in appearance after death. A hopeless prognosis should not hastily be given before surgical treatment has been tried, as in chronic pancreatitis a cure may easily result from treatment. Excision of the pancreas for cancer can seldom be feasible or justifiable except in those cases where the disease is limited to the body or tail of the organ, and then only when it is caught in an early stage. Of the fifteen cases operated on by cholecystostomy or cholecystenterostomy nine recovered and lived for some time in great comfort. Some of these cases recovered so completely as to indicate that they were instances of chronic pancreatitis and not cancer, as was supposed at the time of operation; this leads the author to advise operation in all cases that are not too far advanced.

In cases of cyst of the pancreas he advocates incision and drainage in preference to attempts at total excision of the sac, except where it is very easily removed.

In reference to pancreatitis, he believes that these disorders are similar to those met with in the liver, and that he has seen functional ailments of the pancreas ending in recovery that would come under the head of infective

catarrh of the pancreatic ducts. He believes that as diagnosis becomes more perfected these diseases will be more frequently recognized and awarded their proper place in medicine. Their etiology is generally bacterial, but may be due to extrinsic causes, such as gastro-duodenal catarrh, injury, and lithiasis. The mode of infection is always through the ducts.

In managing acute infective, and frequently suppurative, pancreatitis the treatment of localized peritonitis is followed, getting rid of the products of inflammation by lumbar drainage if possible. Gangrenous pancreatitis can be compared to the same form of appendicitis, and operation is indicated as soon as a probable diagnosis can be arrived at. Other than operative treatment may be necessary till the diagnosis is determined.

Chronic interstitial pancreatitis is a disease too little understood. Its recognition is of vital importance, since it is a disease not only capable of relief, but of absolute cure by surgical treatment. The author has operated on fifteen cases, with fourteen recoveries. It is very often an accompaniment of stone in the common gallduct. It produces symptoms which very frequently simulate cancer of the head of the pancreas.

CECCHERELLI (*Ibid.*) summarizes his views under the following headings:

1. Surgical operations on the pancreas are involved directly in all the questions regarding the functions of this gland.

2. The loss of flesh, the presence of fat in the feces, sugar in the urine, bronze discoloration of the skin, icterus and pains are the symptoms which accompany the majority of pancreatic disorders.

3. Considerable difficulty is encountered in performing complete extirpation. The anatomical conditions are unfavorable; the organ is deeply situated and intimately connected to other viscera. It is very rich in blood-vessels and nerves, and secretes an important digestive ferment.

4. The surgery of the pancreas has not kept pace with the advance in other fields of abdominal surgery. The diagnosis of these conditions is difficult, and is generally arrived at too late for successful operation. It has been shown, however, that operations on the extremity of the pancreas are more often indicated than upon the head.

5. Although experimentation has shown that animals live after complete extirpation, clinical experience has not as yet confirmed this result. Cases are usually malignant and die from the disease before the effect of the operation in removing the pancreas can be noted. In other conditions partial operations are indicated, and should leave behind one of the canals if its outlet can be preserved.

6. The tumors most frequently found in the pancreas are cystic, hæmatic due to traumatism or apoplexy, or retention and hydatid cysts. In these cases intervention is justifiable, but removal of the sac is all that is necessary. In operating, if possible, the wall of the sac should be sutured into the abdominal wound, or, if impossible, the suturing of the cavity should preclude infection of the peritoneum.

7. Calculi of the pancreas can be readily extracted.

8. In necrosis the necrosed portion should be removed.

9. In suppurative or gangrenous pancreatitis the acute period should be left alone. In case of abscess of the pancreas the entrance can be either lumbar, extraperitoneal, or transpleural, or through the median line above the

umbilicus. It is sometimes necessary to remove a portion of the necrosed pancreas.

10. Chronic pancreatitis may constrict the ductus choledochus or the pylorus. The operation is then not on the pancreas, but to relieve the constrictions.

11. Herniæ and wounds are treated on general principles. A displaced pancreas may be sutured in position. Injuries of the ducts or their occlusion may require the formation of a new duct or a pancreatic fistula.

12. Sutures through the substance of the pancreas do not interfere with its function. In suturing the canals the sutures should be close together and should not enter its lumen.

13. In removing the pancreas the ligatures should be applied before the incisions are made, to prevent hemorrhage.

The Technique of Modern Uranoplasty.—MCKERNON (*N. Y. Med. Journ.*, June 16, 1900), in describing the operation which he has successfully employed, states as his belief that tracheotomy should be performed in all cases as a preliminary step to the uranoplasty; that, unless the patient's condition is too critical, the operation should be completed at one sitting. If any lymphoid hypertrophies exist in the pharynx or vault they should be removed prior to the major operation, as the bleeding that ensues would make it impossible to pack the pharynx properly, while the reaction that ensues is of importance in a child and would be a serious complication in cases that are delicate. Enlarged tonsils should also be removed if they coexist with adenoids in the child. They should be removed sufficiently early to permit complete cicatrization before the major operation. When the inferior or middle turbinated bodies encroach or fall into the cleft, their pendent portions should be removed and the base allowed to heal some time before the uranoplasty.

After the tracheotomy the patient is etherized or chloroform administered through a rubber tube, which carries the vapor in through the tracheotomy wound. The mouth is then carefully cleansed, using boric-acid solution, warm normal salt solution, and some similar antiseptic agent. The pharynx is packed with a flat piece of sterilized gauze with a string attached. It thus shuts off the larynx and œsophagus from the entry of all foreign substances and solutions. The pad can be renewed at any time during the operation. The author prefers the Smith gag with its tongue depressor. The face, teeth, and all the buccal folds of the mucous membrane should be included in the antiseptic cleansing.

The edges of the cleft are now prepared, cutting off a strip of mucous membrane, commencing at the posterior edge and cutting forward. Scissors are preferred to the knife on account of the bevelled edge they leave and the close approximation it secures. An elliptical rather than a circular cut is preferred at the anterior angle of the wound in the hard palate. A curved incision is then made near the alveolar border on each side of the hard palate. Its extent is governed by the size of the cleft to be filled. This incision goes down to the bone. A small rather sharp and curved periosteal elevator is now used to separate the periosteum from the bone. This separation must be done slowly and carefully, in order not to injure unnecessarily the palatine

vessels. The periosteum should be separated completely from the hard palate, except a small portion directly behind the front teeth. To relieve the possibility of any tension being exerted by the soft palate, an incision should always be made on either side internal to the hamular process and carried well back. The needles employed are a right and left angle, having long handles and a short curve. The material for sutures can be either a medium-sized silk, a silkworm-gut, or a silver wire. The sutures should be passed from before backward—that is, beginning directly behind the front teeth and extending backward to the end of the soft palate. As a rule, they should be about a third of an inch apart, and, if of silk, can be tied by the slip-knot method or the ordinary surgeon's knot. There should be absolute freedom from tension.

After the oral cavity has been aseptically cleansed by the normal salt solution, the pharyngeal pad is replaced by a fresh one, a thin strip of sterilized gauze, about an inch and a half wide, is passed between the under surface of the repaired palate and the posterior pharyngeal wall. Plain sterilized gauze is then used to pack the lateral incisions, and here the packing should be quite firm. Gauze is used over the whole field. The cavity of the mouth is filled completely to the front teeth.

The patient breathes through the tracheotomy tube, and the wound is treated as any ordinary wound. Nourishment is given by enema per rectum.

If no vomiting occurs the packing should be removed at the end of forty-eight hours, and the part gently sponged with hot saline solution. The packing is renewed daily; the sutures are removed after healing is evident.

Pneumotomy for a Gunshot Wound of the Lung. Recovery.—CHRISTOVITCH (*Rev. de Chir.*, July, 1900) reports a case which he treated by absolute rest for six days, in which the ball entered in the third intercostal space on the left side. At the end of the fourth day a slight impairment of resonance was detected, which increased, with a rise of temperature, until the breathing became greatly embarrassed. The condition was so grave that he decided on operation. After the usual antiseptic preparation, an exploratory puncture showed the presence of blood mixed with pus. An incision in the same area permitted the discharge of numerous clots and pus. The wound was enlarged by the resection of a rib and the cavity explored with the finger. A circumscribed point of resistance was felt in the lung. Further resection permitted the incision of the lung and the removal of the ball. The bleeding was stopped by packing with aseptic gauze. The pleural abscess cavity was treated in a similar manner, and the patient made a rapid recovery.

In reference to these operations the author says that the most favorable condition for operation and recovery is the formation of pleural adhesions binding the injured area to the costal pleura and making it possible to operate without opening directly the pleural cavity. This adhesion of the pleural layers is always an indication of the proximity of the local injury, and is a favorable factor in forming a prognosis.

Operation without the formation of such adhesions places the patient in grave danger of a general pleural infection. If it is possible adhesion of the pleura should be secured before the operation is undertaken. When this is

impossible the lung should be drawn into the wound and the two pleural surfaces securely fastened together before the opening is made in the lung.

A thoracotomy is usually necessary as a preliminary operation. The extent should be governed by the depth of the point to be reached and the area of lung to be explored. It should be planned with the idea of future drainage in view. The most practical sign in operating as a guide to the actual lesion is consolidation and the sense of fibrous resistance met with by the exploring finger. The symptoms of a former localized pleurisy are the guides to the detection of the area in which adhesions will be found. The resisting and recuperative powers of the individual are factors that should be carefully considered in selecting cases for operative intervention.

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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The Curability of Suppurative Cerebro-spinal Meningitis.—NETTER (*Société médicale des Hôpitaux*, May 11, 1900; *Annales de Médecine et Chirurgie Infantiles*, July 1, 1900) is disposed to regard suppurative cerebro-spinal meningitis as offering satisfactory prospects of cure under the use of the warm bath and repeated lumbar punctures. In the preceding year he had successfully treated six cases, and at the time of reporting had another under private care which was recovering. Four of the cases were treated in his own service in the Hôpital Trousseau and two in the service of his colleague, Josias, in the same hospital.

In all these cases lumbar puncture gave issue to a cloudy liquid which yielded a pale-yellow, purulent deposit after standing, and contained the diplococcus meningitidis of Weichselbaum. With all the cases puncture was repeated once, twice, or more frequently, in one case as many as ten operations having been made. In each case the liquid obtained in the punctures after the first contained habitually a smaller number of organisms, and some times after this proved to be sterile. The fluid, as a rule, became less and less purulent with each succeeding puncture. Even when rarely the liquid of the second puncture was more purulent it was still less rich in microbes. Cure was complete in five of the cases. A sixth was left with ankylosis of two joints affected during the course of the disease. The last case was left with labyrinthine disease, the evolution of which at the time could not be predicted. The predominant symptom in all the cases reported was rigidity of the neck. Ocular paralyses were frequent, but were of short duration, and

were followed by complete recovery. Eruptions were in the form of petechiæ, erythema, or herpes.

The duration of the disease was variable, the more rapid cases showing marked improvement after three or four days; others after ten or fifteen days. Two of the cases were very long—one lasting two months, the other more than three months.

The author attributes his successful results above everything to the systematic use of the warm bath, given at a temperature of 100° to 104° F. for from twenty minutes to half an hour, and repeated night and day every three or four hours. His plan of treatment is applicable to both serous and suppurative forms of the disease. He also attaches great importance to lumbar puncture, which he repeats several times during the course of the disease. If the patient could not be induced to take sufficient food subcutaneous injections of serum were regularly employed.

The Diagnosis of Pulmonary Tuberculosis in Childhood.—BERTHERAND, in a recent thesis (*Le Diagnostic de la Tuberculose Pulmonaire chez les Enfants; analysée par le Dr. Laurent, de Rouen; Annales de Médecine et Chirurgie Infantiles*, July 1, 1900, p. 437) emanating from the service and the laboratory of Hutinel, discusses the recent advances in the methods of diagnosis in pulmonary tuberculosis in very young children. It is generally accepted that pulmonary involvement is exceptional before the age of three months; and in the first year Hutinel found but four cases in one hundred and two brought to autopsy. After the first year the proportion is much greater, one-third of the cases examined between the ages of one and two years presenting lesions in the lungs, while from two to three years and from three to four years the proportion was even greater. Contagion plays an essential part, heredity having but secondary importance. As to the seat of lesion, the well-known predilection of the bacillus for the apices of the lungs in the adult is not markedly manifested in the young child, the bases being as readily affected, and a generalized distribution of the disease being quite common.

In the young child the disease most frequently begins secondarily to another infection, such as measles, pertussis, or influenza; on the other hand, tuberculosis is simulated by other infectious conditions, such as gastro-intestinal dyspepsia, syphilitic cachexia, and adenoid vegetations.

In nurslings hereditary antecedents may suggest tuberculosis, but furnish no significant indication of its presence. With Kuss, the author held that tuberculosis in infancy is acquired, almost always by inhalation, the greatest danger lying in the infant's contact with phthisical patients; and in virtue of its heredity it is much more apt to present suitable soil for cultivation of the bacillus.

Since the observations of Legroux, communicated to the Congress of Tuberculosis in 1888, great importance must be attached to polyadenitis as an element of the diagnosis. Bertherand has observed generalized micro-polyadenitis in the majority of his cases, although this manifestation cannot be considered an essential lesion of the disease.

Other conditions often present are deformities of the bones of the phalanges (arthropathic hypertrophiantes pneumique), cutaneous lesions, indurations in the subcutaneous cellular tissue, cold abscesses, otitis media, excessive sweat-

ing, and coolness of the extremities. Hypertrophy of the liver and spleen are very frequent.

Circulatory disturbances, especially tachycardia, in association with normal temperature, are common, and cyanosis of the face and extremities is habitual. Indican in notable quantity has been found by Bertherand in the urine of nearly all his cases; but, according to Debary and Marfan, this cannot be accepted as indicating anything more than intestinal disturbance.

In physical examination auscultation alone does not furnish conclusive evidence, since pulmonary tuberculosis often assumes in the child the form of a diffuse or localized bronchitis. Plessimetry and auscultation must be combined. The coin test is very characteristic. Dyspnoea is out of proportion to the involvement of the lung, and when found without sufficient evidence of other disease capable of causing it, is a sign of pulmonary tuberculosis.

Of the modern methods of clinical investigation the author speaks with approval of the tuberculin test. The serum should be fresh, and the initial dose should not exceed one milligramme. For obtaining expectoration for direct bacteriological examination for the bacillus he suggests several means: The introduction of the fingers into the pharynx, the Nélaton sound, or a curved cotton-carrier or laryngeal applicator introduced into the pharynx as far as the glottis, where reflex coughing brings the expectoration into contact with the cotton. Lavage of the stomach is perhaps the most satisfactory method of obtaining the sputum. Since, however, ulcerating phthisis is not the usual form encountered in young children, the search for the bacillus has only a relative value in diagnosis. For very young infants radioscopy does not give such satisfactory results as in older children. Radiography is much more generally applicable, but is not so conclusive as it is in the adult patient.

Clinical Notes upon Measles.—H. GRIPAT (*Archives médicales d'Angers*, 1900, No. 2) relates a case of infection with measles through a letter. A mother living at Angers received from her sister-in-law living in the Côtes-des-Nord a letter, in which the concluding sentence read: "I am writing, holding upon my knee my little girl, who has just developed measles." The sister-in-law at Angers also happened to have her daughter upon her knee while she was reading the letter, and the child seized the envelope, played with it, and carried it to her mouth. The letter was at once burned. Twelve days later the child developed an indubitable measles eruption. At the time there were no other cases of the disease known to be in the city.

The author also calls attention to an early symptom which may be of value in the diagnosis of measles in the pre-eruptive stage. He has frequently observed that in the beginning of the conjunctival irritation it is the portion of the membrane lining the lower lid that is affected before the ocular portion. The lachrymal caruncle is always reddened before the conjunctiva covering the sclera. By causing the child to look outward the caruncle will be observed as a red projection much more prominent than in the normal state on account of its swollen condition. Moreover, when the child looks directly forward the margin of the lower lid shows a thin, reddened fold sharply set off by the white sclerotic behind it. This is produced by length-

ening of the swollen conjunctiva, which is caused to assume a slight fold behind the Meibomian glands. The effect of this is to give the eye more brilliancy and flash than are usual. If this appearance be observed it is sometimes possible to make the diagnosis from a distance.

The Value of Koplik's Sign in Measles.—WIDOWITCZ (*Wiener klinische Wochenschrift*, 1899, No. 37) has taken advantage of a recent epidemic of measles at Gratz to study the diagnostic value of Koplik's spots. One hundred and fifty-eight cases of the disease were examined. The spots were found in 140 of the cases (88.61 per cent.) and were absent in 18 (11.39 per cent.). In 115 of the cases in which it was present there were found other prodromic symptoms which confirmed the diagnosis. On the contrary, in the other 25 cases it was alone present in the absence of all other prodromic symptoms.

The author therefore concludes that it is impossible to attribute to Koplik's sign a pathognomonic value, since it was wanting in one-tenth of the cases, and most frequently coexisted with other prodromic symptoms. Another point which he thinks diminishes the value attributed to this phenomenon is the fact that he has observed it in several affections other than measles. He has found it ten times in 135 cases of rubella, in one case of follicular angina and in another of stridulous laryngitis.

[It seems to us that a diagnostic sign which can be found in nearly 90 per cent. of the cases twenty-four to forty-eight hours before the eruption makes its appearance is of the utmost value, especially when the eruption fails, as it occasionally does, to present a characteristic appearance, and resembles strikingly the early rash of smallpox. This mistake has been more than once made with disastrous results to the patient, who has been hurried to a smallpox hospital. The buccal eruption, if previously observed, nine times out of ten would have prevented this mortifying error in diagnosis. In the cases in which it exists as the only prodromal symptom valuable time can be gained in separating the patient from other children. The statement that the author has observed the spots in ten cases of rubella calls for more careful observation of cases of this disease in the future. The differential diagnosis between rubella and measles is often difficult, and errors of diagnosis are always possible, especially during epidemic prevalence of both diseases.—ED.]

Another observer, ROLLY (*Münchener medicinische Wochenschrift*, 1899, No. 38), has examined 78 cases of measles and found the sign in 24 from four days to six hours before eruption. In 11 cases in which it was not observed the examination was not made until a period varying from twenty-four hours before eruption to four days after, too late a period from which to form definite conclusions as to the presence or absence of the buccal eruption at an earlier stage of the disease. He also states that examination for the spots has constantly given negative results in scarlatina, miliaria, bronchitis, pneumonia, diphtheria, aphthous stomatitis, scarlatiniform exanthems, etc.

The Presence of Diphtheria Bacilli in the Mouths of Healthy Individuals.—KOBBER (*Zeitschrift f. Hygiene*, 1899, Bd. xxxi., S. 433) has made an extended research in Flügge's laboratory as to the frequency with which the bacilli of diphtheria are found in healthy throats. The study embraces ex-

aminations of 128 persons who had been in contact with cases of diphtheria, and of 600 who had not been knowingly exposed to the disease. In the cases in which the bacilli of Loeffler were found the diagnosis was made: 1. By culture upon serum and microscopic study after six hours. 2. By Neisser's double stain with cultures varying from nine to eighteen hours' growth. 3. By test of the acidity. 4. By inoculation of guinea-pigs.

The results of these examinations showed that the frequency of diphtheria bacilli in healthy throats has been greatly exaggerated. In the statistics generally quoted bacilli were found in 18.8 per cent. of individuals who had been exposed. In the author's series the organisms were found in only 10 out of the 123 cases (a percentage of only 8). The same divergence of results was noted among the unexposed, the author's 600 cases having but 15 (2.5 per cent.) who showed the presence of the bacillus, as compared with 7 per cent. in other statistics. Further inquiry among these 15 showed that 10 could be considered to have been exposed, directly or indirectly, to a focus of the disease. The proportion of unexposed individuals who carried the organism in their throats would thus be still further reduced to 0.83 per cent.

The organisms found in the mouth secretions of ten persons who had been exposed to patients suffering from the disease were all virulent. Among the 15 positive cases of the second series the bacilli were non-virulent in 10.

Enuresis and Irritable Bladder in Children.—BIERHOFF (*The Jacobi Festschrift*, p. 148) pleads for greater accuracy in the investigation of cases coming under this general heading. He believes that the greater proportion of these cases are not pure neuroses, but manifestations of local changes in the urethra or bladder. He classifies these cases under one heading, since he believes that enuresis, or true incontinence, diurnal as well as nocturnal, excepting only those due to central nervous disease and those due to polyuria or foreign bodies in the urethra or bladder, is only an advanced stage of those conditions which cause the so-called "irritable bladder" or vesical hyperæsthesia. He considers that the many causes to which this condition has been attributed by many writers are remote only, acting in conjunction with, or as causes of, a hyperæmic or inflamed condition of the deep urethra, or the sphincter, or both. Phimosis, redundant prepuce, preputial adhesions, urethritis, vulvo-vaginitis, and onanism are counted among the factors which cause congestion of the deep urethra; epispadias and hypospadias are considered mere chance occurrences in this condition and devoid of any influence in causing it, unless they offer a mechanical obstruction to the flow of urine; bacteriuria, vesical calculus, tumor or tuberculosis, and pyelitis evidently cause inflammatory changes at or near the sphincter; acute febrile diseases, menstruation, indigestion, constipation, and intestinal parasites give rise to vesical hyperæmia; hypertrophied tonsils, adenoids, eczema, urticaria and similar conditions are causative only in that they disturb sleep and tend to keep the child in a semi-conscious condition.

In addition to careful and complete examination of the urine, the author considers cystoscopic examination under general anæsthesia, when the age of the patient will admit, to be a justifiable procedure, especially when positive diagnosis is imperative, as in cases in which the urine is purulent or hemorrhagic in character, or where there is suspicion of calculus.

The treatment which has given the greatest satisfaction in the author's hands is the following: where the patient is too small to admit of direct local treatment, hot sitz-baths once or twice a day, the appropriate treatment of accessory causes, the restriction of fluids in the evening, combined with a light evening meal at night; where possible, the child is laid so that the head is lower than usual, or, better still, no pillow is permitted and the foot of the bed is raised. Where local treatment is possible, applications through the endoscopic tube directly to the sphincter itself and the mucous membrane of the trigone are made, or vesical irrigation and instillation are carried out.

THERAPEUTICS.

UNDER THE CHARGE OF

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Therapeutics of Heart Disease.—DR. WILLIAM M. THOMSON insists on accuracy of diagnosis as to the existing state of the heart before any treatment is instituted. With fever, cardiac pain, either sensible to the patient or elicited by upward pressure during expiration under the left costal arch, with hurried breathing, rapidly rising pulse, disturbance of rhythm with or without murmurs require: Leeches to the præcordium, then poulticing (flaxseed and extract of hamamelis), laudanum added just before application; the whole to be covered with oiled silk. Acute pericarditis may be fatally aggravated by exposure to cold. Because the nervous relation between skin and heart is so close, vascular sedatives to the former are preventive or remedial against acute carditis. Topical blood-letting is of value. A leech applied to the sternal notch will relieve the dyspnoea of thoracic aneurism. Several applied to the epigastrium check the vomiting of acute gastritis. Leeching the mastoid relieves the pain of meningitis. In rheumatism with impending carditis, surface chill can be avoided by placing the patient between blankets. In acute carditis aconite is of paramount importance, relieving cardialgia and slowing the heart. The alkaline treatment of rheumatism gives better results, so far as the heart is concerned, than do the salicylic salts. A constant exhibition of aconite pushed to point of slowing and quieting the pulse is also indicated in acute exacerbations of chronic heart disease. Dropsy and pulmonary engorgement are largely due to cardiac fatigue; rest in bed overcomes them and causes a diminution in dyspnoea, with great general improvement. Indications for giving aconite rather

than digitalis, etc., are strong laboring heart impulse and a rapid pulse. The latter with cardialgia also requires aconite. But a rapid pulse of high tension often indicates commencing heart disease following primary kidney disease. *Veratrum viride* is more satisfactory under these conditions, through its specific dilatation of the arterioles in addition to slowing heart action. In acute parenchymatous degeneration, as that due to diphtheria, with digestion and dissolution of muscle (cardiac) tissue, and of the muscular walls of the arteries, blood-pressure is lowered and continues progressively until death. Surface pallor is characteristic of this condition. Digitalis in these conditions is very mischievous. To produce its contractile effect it must act on nearly normal muscle fibre. With degenerated fibres, either fatty or parenchymatous (diphtheria), or from weakening of fever toxins (typhoid), it is powerless. The general effect of digitalis is to diminish the size of the heart's cavities. Therefore, when the heart walls are overdilated too much residual blood remains after each systole, from inability of the muscle to contract. In the cardiac weakness of diphtheria alcohol is indicated in large doses, also strychnine and caffeine; camphor, eight grains, hypodermatically in sterilized oil, twenty minims, repeated as occasion requires. The same are indicated in rheumatic heart-failure. Indications for stopping aconite and giving other sedatives, with a change to stimulants, are: Feeble heart beat, with cold extremities. Following a severe rheumatic attack long rest in bed, especially in children, is of great value. Continuous exhibition of aconite often prevents a subsequent endocarditis. Pericarditis, followed by adhesions to the chest-wall, prevent the heart from fully contracting; then result great dyspnoea, general valvular incompetence, and dropsy. Strapping the left chest firmly gives great relief. For the cardialgia, belladonna is serviceable, allaying spasm and restoring normal rhythm. It is often useful in mitral stenosis. Myocarditis is a common cause of failure of compensation after middle life. It precedes valvular incompetence in many instances. Gastric and intestinal flatus, with or without ascites, embarrasses the heart. Sodium benzoate, ten grains thrice daily, is useful; sodium phosphate, two drachms in a tumblerful of water each morning. Blue pill once every four nights, with half an ounce of sodium phosphate next morning, acts well as a laxative. No diuretics can equal rectal irrigation with decinormal saline solution, four gallons at 110° F. (Kemp's irrigator). For these patients digitalis is invaluable; in dilatation following hypertrophy, with mitral regurgitation, etc., half an ounce of the infusion of digitalis every four hours for three days is to be followed by thirty drops of a mixture of equal parts of the tinctures of digitalis, *strophanthus*, and *nux vomica*. Nitroglycerin should be given with each dose of digitalis, to counteract increased arterial tension. If the three tinctures are not borne by the stomach give the following: Sparteine sulphate, one grain; powdered squill, half a grain; citrate of caffeine, one and a half grains; strychnine, one-thirtieth of a grain. Permanent improvement comes from restoration of nutrition and not from stimulation of function. Fresh air is of the greatest use in restoring damaged muscles to health. Iron in chronic heart disease helps to oxygenate the blood and improve nutrition. Chronic endarteritis can be treated with corrosive sublimate, one twenty-fourth of a grain three times a day for a week at a time; omit for a fortnight. Sodium

is preferable to potassium iodide, for potash is depressing to the heart. It should regularly be used in chronic enlargement of the heart, with arteriosclerosis. Oertel's mountain climbing, Schott's baths, etc., are often very useful. The latter open closed arterioles by cutaneous stimulation, and thus lessen arterial tension; relief for the heart follows.—*Medical Record*, 1900, No. 1532, p. 441.

Puerperal Septicæmia: Bacteriology and Serum Treatment.—DR. L. A. HERING, following a bacteriological *résumé*, discusses serum treatment. He believes it to fail: 1. Because old serum is used. 2. Antistreptococcic serum is useful only against streptococci; in a mixed infection it must be of no avail. 3. Delay in commencing treatment and insufficient doses. 4. Overstimulation of the patient. Uterine detritus is to be removed by curettage and diluting with weak bichloride solutions, and the introduction of a single strip of iodoform gauze. Pus, if within reach, is always to be evacuated per vaginal incision. Morphine is contraindicated. Quinine impairs the oxygenation of the blood, but it increases phagocytosis; it is best not to administer it. Patients are to be cautiously stimulated; too much alcohol and strychnine act as depressants. Antistreptococcus serum is the main medicinal reliance. The serum favors phagocytosis.—*New York Medical Journal*, 1900, No. 14, p. 493.

Alcohol Compresses in the Treatment of Peritonitis.—DR. SEHRWALD saturates compresses with 96 per cent. alcohol and covers the whole abdomen; over these a waterproof material is laid on cold, wet compresses above all; this lessens the tenderness of the abdomen. The results observed were cessation of the vomiting, strengthening of the heart, and improvement of the general condition. Later came relief of pain and return of appetite, with diminution of fever.—*Therapeutische Monatshefte*, 1900, Heft. v., S. 243.

The Topical Treatment of Articular Rheumatism.—DOTT. F. BATTISTINI presents a valuable *résumé* of the literature. Of course, pure oil of wintergreen or the synthetic methyl salicylate may be applied to the painful joint and covered with cotton and rubber tissue. To prevent the odor, which after a time becomes disagreeable, an ointment may be employed as follows: Methyl salicylate, 3; liquid vaseline, 5. Salicylic acid possesses the advantage of being inodorous, but it produces reddening of the skin and, after a time, desquamation. The following is recommended: Salicylic acid, 4; sodium salicylate, 3; extract of belladonna, 1; vaseline, 25. A 10 per cent. solution in vasogen is also efficient. More rapid absorption of the salicylate, as shown by its excretion in the urine as salicylic acid, is obtained if an animal fat is substituted for vaseline or glycerin. For this the following formula is eligible: Salicylic acid, 10; lanolin, 10; oil of turpentine, 10; lard, 100. Sodium salicylate, salol, and salacetol are less trustworthy, but may be utilized as follows: Salol, 8; menthol, 5; ether, 8; lanolin, 60. This is especially useful in so-called gonorrhœal rheumatism. Guaiacol, either pure or in alcoholic solution or associated with menthol or terpinol, is sometimes satisfactory. For instance: Guaiacol, 4; terpinol, 10; 85 per

cent. alcohol, 10. For the more chronic forms, ichthyol, 14; oil of turpentine, 5; lanolin, 5; oil of wintergreen, 4, is satisfactory.—*Rivista Critica di Clinica Medica*, 1900, No. 16, p. 311.

[Our personal observation leads to a preference for the salicylic acid, turpentine, lanolin, and lard mixture, although the others mentioned have been found to be useful. Quite remarkable results have been obtained with salol, menthol, ether, and lanolin, as above noted, in rebellious so-called gonorrhœal rheumatism. One patient is recalled who, after having received all of the known remedies, including static electricity and cataphoresis, was relieved by it of pain and disability within a week.—R. W. W.]

Oil of Gaultheria.—DR. EDMUND VON ROTTENBILLER reports the results obtained in one hundred and twenty-two instances of its use. He reports that its internal administration will relieve pain and produce perspiration, and in practice these effects are speedily produced. In addition baths are employed. Of ninety-seven instances of chronic polyarthrititis but five followed an acute attack. The remainder were subacute or chronic, and in these (about 60 per cent.) influenza preceded the attack. Heredity could be traced in one-fifth of the patients. Ten patients suffered from so-called gonorrhœal rheumatism; all showed good results. Three patients suffered from arthritis deformans, but although the deformity was not markedly influenced, the pain was lessened and the general condition relieved. One instance of purpura with rheumatism was cured. The oil is administered in gelatin capsules, of which ninety drops constitute the daily amount. One capsule will hold about twenty drops of the oil. The first dose (two capsules) is given at bedtime, the second an hour later, and so continued until the whole amount is taken during the night. No untoward symptoms have been noticed. The oil is excreted partly by the kidneys and partly by the bowel; it may be found in the urine twenty minutes after its administration.—*Klinische-therapeutische Wochenschrift*, 1900, No. 20, S. 610.

Intestinal Antisepsis in Typhoid Fever.—DR. J. M. ANDERS considers this branch of the therapy of typhoid too little heeded, and that in importance it is next to cold bathing and feeding. The principal indication for antisepsis is to combat meteorism due to decomposing matter in the intestines. Owing to defective hepatic secretion in this disease the bile and other normal antiseptic secretions are present in diminished amounts. The diminished supply of hydrochloric acid, with the frequent overabundant alimentation, aids in establishing tympanites. Milk being the chief food, hydrochloric acid in small doses after each feeding is recommended. Calomel for the first few days in sthenic patients is useful. It acts both as an hepatic stimulant and as an intestinal antiseptic; retained decomposed matter is removed and the bowel made ready for antisepsis. The potency of the bacilli is unaffected by such drugs. Bacilli are not destroyed, but develop their toxins in the mesenteric glands and gall-bladder. The intestinal disturbance accompanying the fever is partly dependent on disordered function due indirectly to typhoid infection. Some toxic elements are derived from usually harmless organisms normally present in the intestine, whose virulence is only temporary. Water used freely tends to increase the

elimination of the hypotoxins by the kidneys. In view of the fact that where moderate constipation is present there is less tympanites than with diarrhoea, the purgative treatment is not advocated except in the early stage. Saline laxatives in divided doses until effective often curtail the intermittent form seen in protracted cases. Diarrhoea is sometimes ascribable to the irritating properties of food-residue in too abundant feeding. Mild laxatives will correct this. The Woodbridge treatment is mentioned and condemned. Intestinal antiseptics influences tympanites and diarrhoea favorably; less than four movements daily do not indicate such treatment. Salol is considered the best drug of the aromatic group; its average dose is three grains every three hours. It may be given in increased doses until the urine is perceptibly tinged. The powdered form is preferable. Tablets may pass through the bowel unchanged. If there be marked distention of the bowels, turpentine is more satisfactory—white turpentine, three grains every three hours. Constipation is best treated by soap-suds enemata on alternate days. Intestinal irrigations diminish the absorption of toxins; they are not to be used when the main lesions are in the small intestines and there is only moderate tympanites. Indications are: Ulceration in the colon, active diarrhoea, and marked tympanites. The antiseptic solution used must be warmed; it must be introduced gently and at low pressure, in order to avoid overdistention of the inflamed colon. A soft-rubber rectal tube, fenestrated, is recommended. One quart of fluid is injected (fountain or Davidson syringe) and allowed to flow out again. Salicylic acid or mercuric chloride are the best drugs, $\frac{1}{2}$ of 1 per cent. for the former, 1 part in 6000 for the latter. Three daily usually suffices.—*International Medical Magazine*, 1900, No. 4, p. 241.

Suprarenal Extract.—DR. ANDERODIAS reports six instances of the use of this remedy in the treatment of Addison's disease. The first symptom to be changed was the arterial tension, and with improvement in this came a disappearance of the gastro-intestinal symptoms and a gain in strength. The symptom most tenacious was the bronzing; in one instance only did it disappear, in two it was lessened, and in the remaining ones it was unchanged. Of these patients three were completely cured, two notably relieved, while one remained the same. The duration of treatment varied from three to five months. The remedy should be given by the mouth, and not hypodermatically, in small doses—one to two grains—and continued until cure takes place.—*Journal de Médecine de Bordeaux*, 1900, No. 29, p. 513.

[We would emphasize the caution against the subcutaneous use of this substance. Personal observations of serious collapse only confirm what the remarkable vasoconstrictor effects of the drugs would lead us to expect. In fact, its action upon the bloodvessels clearly antedates its effect on the heart.—R. W. W.]

Serum Prognosis in Typhoid Fever.—M. LE DR. M. J. ROUGET draws the following conclusions from a series of experiments: 1. No law can be established determining the ratio between the severity of typhoid fever and the agglutinating power of blood-serum. 2. In certain instances an apparent relation can be shown between the outlines assumed by the agglutinating

masses and the intensity of the infection; it is a probability, and is evident only after the crisis, when the graphic curve of the agglutinating power of the serum is complete. 3. The agglutinating power is a variable quantity; the cause of its fluctuations cannot generally be determined. 4. Complications of convalescence are often announced by an augmentation of agglutinating power, which remains marked for some days. 5. To be exact, the curve (graphic) of agglutinating power should be constructed from the results of daily tests.—*Archives de Médecine et de Pharmacie Militaires*, 1900, No. 3, p. 191.

[The advocates of the so-called Brand bath do not seem to consider that under efficient intestinal antiseptics—and there is not the slightest doubt of its practicability—there exists no reason for its employment. There is no doubt that the theory of the Woodbridge treatment is correct; a little less energy devoted to its condemnation, and considerably more toward making the method consonant with advanced therapeutics, is desirable.—R. W. W.]

The Use of Opium in the Summer Diarrhoeas of Children.—DR. FLOYD M. CRANDALL believes that opium is contraindicated (1) in the first stages of acute diarrhoea, before the intestinal canal has been freed from decomposing matter; (2) when the passages are infrequent or of bad odor; (3) when there is a high temperature or cerebral symptoms are present; (4) when its use is followed by elevation of temperature or the passages become more offensive. It is indicated (1) when the passages are very frequent, with pain; (2) when they are excessively frequent, large, and watery; (3) in dysenteric diarrhoea preceded by castor oil or a saline; (4) in late stages, with small, frequent passages; (5) when the passages consist largely of undigested food and the bowels act as soon as food is taken into the stomach. Opium should always be given alone and the dose carefully regulated.—*International Medical Magazine*, 1900, vol. ix., p. 481.

The Action of Atropine upon the Secretion of Hydrochloric Acid of the Gastric Juice.—DOTT. G. GAGLIO finds that this not only paralyzes the reflex gastric secretion, but also that produced by the presence of food in the stomach. His observations upon dogs seem to justify the use of atropine in persistent hyperchlorhydria or Reichmann's disease, as was first recommended by Ivanowitch and by Rummo.—*La Riforma Medica*, 1900, No. 160, p. 116.

The Value of Gelatin as a Hæmostatic Agent.—DOTT. A. SALOMONI concludes that: (1) Gelatin mixed directly with blood outside of the organism readily favors coagulation, producing soft, not lasting, or retractile clots, such as are obtained with normal blood or blood treated with real hæmostatic substances. (2) Injected into the bloodvessels it is borne in large amounts, but without producing coagula in them; it disappears slowly; blood which has received this substance by injection coagulates a little more rapidly than normal blood, but the clot is soft, not lasting and retractile. (3) If injected subcutaneously or into the peritoneal cavity it is absorbed very slowly, and then only by the lymphatics. It does not render the blood more coagulable

than the normal. The point of injection becomes infiltrated from marked leucocytosis set up by the positive chemotaxic properties of the gelatin.—*La Riforma Medica*, 1900, No. 172, p. 254.

Gout.—DR. JAMES EDMUNDS has for some years discarded sodium salicylate in favor of the potassium salt, which in doses of ten grains, given in cachets, affords great relief in the acuter cases, and does not give rise to cardiac depression. So long as the urine is turbid, potassium bitartrate, given in barley-water and sweetened, is recommended. Twenty grains twice, or possibly thrice, daily at meals is sufficient. For an aperient an old formula is presented: A teaspoonful of a powder consisting of powdered guaiac, 4; precipitated sulphur, 4; and compound tragacanth powder, 1, is given in a wineglass of water or gruel at bedtime.—*British Medical Journal*, 1900, No. 2058, p. 1404.

Treatment of Diphtheria.—DR. JOHN BLAKE WHITE states that dependence upon either the microscope or what is called the "culture test" for the diagnosis of diphtheria has proved too often a vain reliance. Statistics thus far have proved that among the host of remedies proposed for the treatment of this disease not one is entitled to superior confidence. There are local resorts, with which we are all familiar, to dissolve the pseudomembrane, and there are also others supposed to act antiseptically and to bring about chemical changes or to modify or annihilate micro-organisms. In order to sustain the probable virtues of antitoxin the attempt has been made by enthusiasts in its behalf to compare its immunizing effects with that of inoculation for smallpox, but brief considerations will serve to dissipate the comparison, since the effects are in no way identical. To recount the various remedies which have from time to time been put forth for the cure of diphtheria would be as useless as it would be a vast undertaking. Every hopeful promise from the vegetable and animal kingdoms has been exploited, until finally we seem now to be in the presence of the *ultima thule* of resorts, and those of us who have not quite lost our reason stand aghast at the extravagant claims of a treatment as treacherous as it is grotesque in character.

DR. JOHN WINTERS BRANNAN presented the advantages derived from the use of antitoxin, and stated that there was now a much smaller percentage of deaths from laryngeal stenosis than formerly, while the proportion of deaths from pleuropneumonia had markedly increased, the statistics showing that 53 per cent. of all deaths were due to this cause.

DR. JOSEPH E. WINTERS gave the statistics for different years at the Willard Parker Hospital, and showed that there has been only one year since the introduction of the antitoxin treatment in which the mortality has been as low as it was before the use of antitoxin, and that was in 1898. Citations of fatal results due to antitoxin were made.—*Pediatrics*, 1900, vol. x., p. 41 *et seq.*

[This brief report of the remarkable discussion before the Medical Association of the Greater City of New York is presented because it emphasizes the importance of various reports recently made upon antitoxin, which are by no means indicative of its value as a remedial agent or of its safety when

administered in the presence of a severe infectious disease. While in the earlier period of its employment untoward symptoms and even death might be explained away on the ground of toxic substances not related to the antitoxin being present, and even later, that while the horse could not be eliminated in its preparation, minor unpleasant manifestations would appear, at the present there is no reason that antitoxin *quoad* antitoxin should not stand or fall on its own merits. The enormous clinical experience of those who are now prominent in such discussions as this cannot be ignored, and their evidence must be accepted as indicating the turning of the tide.—R. W. W.]

The Therapeutic Indications of Cannabis Indica.—DR. H. EDWIN LEWIS finds in pain not due to distinct pathological lesions the chief indication. In migraine, hemicrania, the various neuralgias, and the headaches due to eye-strain it may be used with marked success. In the pain of multiple neuritis and tabes dorsalis it is one of the best of anodynes, and to relieve the chest pains of phthisis it is often very serviceable. In the various neuroses accompanying pregnancy and the climacteric, and the particularly violent nerve storms of the artificial menopause, it is satisfactory. Dysmenorrhœa not due to anatomical or inflammatory causes is promptly relieved, with few after-effects. Impotence, more or less complete, which is due to urethral hyperæsthesia, is certainly benefited by the sedative or analgesic action. In several instances of diabetes mellitus improvement has followed. It will relieve the intolerable itching and burning of various skin neuroses. The dose is one-fourth to one grain of the assayed solid extract. A quarter of a grain may be repeated every one, two, or three hours as required.—*Merck's Archives*, 1900, No. 7, p. 247.

Hedonal.—DRS. NAWRATZSKI and ARNDT state that the ideal hypnotic should act promptly and safely, be of pleasant taste, soluble in practicable media, adapted to subcutaneous injection (if needed), be devoid of subjective and objective untoward phenomena, and of moderate price. Recalling the ethyl-urethran of Schmiedeberg, it is believed that by the introduction of the higher alcohol in place of the ethyl radical a more intensive hypnotic action might be obtained. This substance, which is methyl-propyl-carbinol-urethran, appears as colorless crystals of a peculiar, burning, peppermint-like taste, insoluble in cold water, but soluble up to 2 per cent. in water at 122° F. It is soluble in 50 per cent. alcohol. It is suggested that it may be administered in warm milk. The dose varies from seven to thirty or even forty-five grains. After the last-named dose sleep follows in about thirty minutes and lasts from two to nine hours without interruption. On awakening there is generally a marked desire to urinate. In fact, the drug is diuretic; so much so that sleep may be interrupted. There is no change in the pulse, respiration, or temperature.—*Therapeutische Monatshefte*, 1900, Heft vii., S. 372.

Lobar Pneumonia Treated with Silver Salts.—DOTT. CACCIANIGA reports the results of treatment in 112 patients suffering from acute lobar pneumonia. Two and one-half to three grains of silver nitrate, divided into

five pills, are taken daily, or it may be administered in mucilage. In three epidemics the mortality with this method was 17 per cent.; with others, 28 per cent. Of forty-seven patients (sporadic) but three died, viz., 6.3 per cent.

DOTT. COMINI had successfully treated five out of six patients with silver salts; the sixth was treated by other methods and died.—*Gazzetta degli Ospedali e delle Cliniche*, 1900, No. 84, p. 867.

Cod-liver Oil Injections for Tuberculosis.—DR. W. ZENNER has employed the following formula for rectal injection: Purified pancreatin, 10; inspissated ox-gall, 1; sodium chlorate, 3; dissolved in water, 100; and allowed to digest for two hours with cod-liver oil, 500, to which a few drops of the ethereal oil of eucalyptus are added. The bowel is cleansed by enema, and from two to three ounces of this emulsion, previously warmed, is inserted through a rectal tube each night, the patient being in the knee-elbow position. This formula is based upon the observation of various authorities, and is designed to possess easy absorbability and high nutritive value.—*Therapeutische Monatshefte*, 1900, Heft 6, S. 305.

The Treatment of Gastric Disease.—DR. C. LYON protests against the use of chemical means in the treatment of gastropathies. He submits that (1) the action of drugs, for example, the alkalies and acids, does not always agree with physiological teaching, and, further, even physiologists are not in harmony concerning the action of these drugs. (2) An improper course is taken in attempting to treat patients solely upon the basis of a hyperchlorhydria or hypochlorhydria which may appear on analysis. (3) The therapeutic results were especially satisfactory when a severe regimen was prescribed to the exclusion of all systematic medication. (4) There is no different regimen for each variety of disease; but, in fact, the same can be instituted in the great majority of instances. The secret of success lies in assuring, at the outset, rest for the stomach by a restricted diet of one or several types of food, according to the case, and then gradually returning to normal diet. (5) Physical means are adjuvants of the first rank, and in the vast majority of instances they assure cure. They are rest, hydrotherapy in different forms, massage, and lavage of the intestine. The opinion is offered that inert powders intended as a "dressing" for the mucous membrane irritate the stomach, and on that account should be excluded.—*Revue de Thérapeutique Médico-chirurgicale*, 1900, No. 14, p. 179.

Treatment of Gastric Ulcer.—DR. L. BOURGET reports upon eighty-eight patients who have been under his care. Whether hemorrhage has taken place or not the stomach contents are removed by the stomach-tube, and then washed with about three ounces of water; next, from three to five ounces of a 2 per cent. solution of ferric chloride, to which one-half of 1 per cent. of potassium chlorate has been added, are placed in the stomach by the tube and removed at once. The procedure is repeated until about thirty ounces of the solution have been employed. Lastly, about two ounces of the solution are kept in the stomach, and the patient lies upon his abdomen. Five minutes later a glass of a 2 per cent. solution of sodium bicarbonate is taken into the stomach to insure the precipitation of the iron

of the solution. This procedure should be repeated every day. Noting that the moment that bouillon, peptones, wine, sugar, or salt solution were introduced into the rectum the gastric secretion was excited, none of these is recommended, even by the rectum. During the acute stage a rice soup is advised, since experience has shown its value. It is prepared merely by cooking rice in water to which some butter and salt are added. Of greater nutritive value is rice-milk—one and one-half ounces of rice to a quart of milk. Later, as cicatrization goes on, sugar may be added.—*Therapeutische Monatshfte*, 1900, Heft 7, S. 350.

Tannigen.—DR. CHARLES M. CLARK, in all watery discharges from the bowel, no matter what the direct or secondary cause may be—whether it be nervous or inflammatory or from acute dyspepsia due to overfeeding as well as overstimulation, which gives flatulence with foul-smelling, serous discharge—has recourse to tannigen, with bismuth subcarbonate and resorcin.—*Therapeutic Gazette*, 1900, No. 6, p. 372.

[While this report is emphatic in behalf of tannigen, the results of the administration of resorcin and bismuth must not be ignored.—R. W. W.]

OBSTETRICS.

UNDER THE CHARGE OF

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The Mortality of Obstetric Practice at the Present Time.—At the recent meeting of the British Medical Association the address on obstetrics was given by SMYLY, who took as his subject the maternal mortality in child-bed (*British Medical Journal*, 1900, No. 2067). After reviewing the history of the development of asepsis in obstetrics he traced the improved results in obstetric hospitals, and drew attention to the statements of Duncan and McClintock to the effect that it is practically impossible to ascertain mortality in obstetric practice in private cases, and that up to 1870 it was in London practically what it was in 1660. The statistics of the Rotunda Hospital are given, showing the great improvement following aseptic practice.

Attention is also directed to the writings of White, of Manchester. In 1791 he published a remarkable work, in which he practically recognized the essential factor in puerperal septic infection and advised the use of local disinfection. Through lack of influence to enforce his conclusions his work attracted no attention.

Medullary Narcosis During Labor.—In the *Deutsche Zeitschrift für Chirurgie*, Band li., p. 361, BIER contributes a paper upon "Medullary Narcosis."

TUFFIER (*La Semaine Médicale*, May 10, 1900) reports sixty-three operations upon the lower extremities and the lower portion of the trunk, conducted under spinal narcosis by cocaine. He has increased the number of operations by this method very considerably since the publication of his paper.

In the *Centralblatt für Gynäkologie*, 1900, No. 28, KREIS reports his application of this method to labor cases in the clinic at Basel. His experience is practically as follows: His first case was that of a primipara, aged twenty-three years, in whom the injection of 1 centigramme of cocaine between the fourth and fifth vertebræ removed the sensation of pain. The forceps was applied to the head of the child low in the pelvis, and the delivery ensued without pain to the patient. The mother stated that the forceps could be felt when introduced, but that the birth of the child was appreciated only as the emptying of the abdomen. Laceration of the perineum occurred and episiotomy was performed, but neither this nor the closure of the lacerations gave the patient pain. She felt intensely cold in the feet and legs, had headache, dizziness, and vomiting, with slight rise of temperature, which soon subsided. The second patient had a breech labor, and it was necessary to extract the head of the child because the pelvis of the mother was contracted. The patient experienced a moderate degree of pain during the extraction. No unpleasant symptoms followed the use of cocaine. The next patient was a primipara, aged twenty-seven years, in whom the injection produced vomiting, abnormal sensations, and labor was delayed. It was finally necessary, because of the mother's exhaustion, to deliver the patient with forceps, under the use of chloroform. A large amount of chloroform was required to produce narcosis. Expression of the placenta also became needful because of bleeding. The patient, however, reacted well and made a good recovery. In the case of another primipara the use of forceps was necessary, and while the patient complained of no pain, she became excessively nervous and unruly. She had also strong after-pains. A primipara, aged twenty years, complained of abnormal creeping sensations in the limbs, vomited several times, and brought the child down upon the pelvic floor. Delivery was spontaneous, although delayed. The patient experienced little pain during the closure of the lacerated perineum. In the case of a primipara, aged twenty-seven years, the patient's sensations were abnormal, but the pains of labor were very strong. They did not, however, cause suffering. The patient vomited freely while the child was passing through the birth-canal.

Kreis concludes from these few cases that the action of the uterus was not interfered with by the cocaine. The sensation of pain was largely destroyed, the patients describing only a tension in the abdomen. The reflex action of the abdominal muscles was destroyed, and the patient did not help herself unless she was requested or had resolved to do so. After-pains did not last more than two hours. The general impression given by these cases was that the phenomena of labor were rendered largely painless by this method. Vomiting and headache were the principal complications. It cannot be alleged that this method will prove successful in all cases, especially in those where the patient is required to make very strong voluntary effort, or in the case of very highly nervous and excited women, who are thrown into a condition of terror by an obstetric operation aside from the pain suffered.

In the *Medical News*, August 25, 1900, MARX describes some interesting experiments conducted by him at the New York Maternity Hospital. He applied the method of Tuffier to mitigate the pains of labor. Tuffier performed operations after partially anæsthetizing the patient with cocaine injected into the subarachnoid space. Marx conducted his experiments by making aseptic the skin of the patient's back from the coccyx to the middle of the dorsal vertebræ. A needle, about 10 cm. long, attached to a hypodermatic syringe, was inserted half an inch in front of and just outside the fourth lumbar vertebra. Puncture was made between the third and fourth or fourth and fifth vertebræ. The needle was pushed downward until the spinal fluid was seen to run. Ten minims of a cocaine solution, representing one-sixth of a grain, were then injected and the needle withdrawn. Aseptic precautions were employed throughout.

The suffering of labor was greatly lessened, and it was possible to apply forceps and perform version without further anæsthesia. General disturbances, such as nausea, vomiting, severe headache, throbbing and fulness in the head, slight increase in pulse-rate, chilly sensations, and elevations of temperature up to 103° F. on the evening of the day of operation were noted. This was not thought to be due to the cocaine, as these symptoms followed the injection of saline solution. Nitroglycerin and morphine were used in some cases to control them. The effect followed the injection in from seven to twelve minutes, and lasted about three hours. When the remedy acted sufficiently there was no spontaneous bearing down. On command, the patient brought her abdominal muscles into play. The uterus contracted normally, and no evidences of relaxation or tendency to hemorrhage were observed. In one case the patient received one-half grain of cocaine in less than seven hours because of retention of the placenta, it being finally necessary to peel off the placenta to deliver it. This patient made, like the others, a good recovery.

[While these experiments are of decided interest, further investigation would be needed before this method of treatment could be brought into general use. They draw attention to one interesting fact, that uterine contractions are not in proportion to the amount of suffering which the patient experiences, and that the doing away of suffering does not lessen the uterine contractions. It is a familiar fact to all obstetricians that complete or partial anæsthesia removes the inhibitory power of the cerebrum and often strengthens uterine contractions.]

Intra-uterine Application of Elastic Bags.—RUBESKA (*Archiv für Gynäkologie*, 1900, Band lxi., Heft 1) gives the results of his experience in the use of elastic bags in obstetric practice. He finds them especially useful in cases where the expulsion of the foetus is premature or where some complication exists which interferes with the normal course of labor. Thus in several cases of abortion and premature labor the application of a medium-sized bag partially distended with normal salt solution was followed by the spontaneous emptying of the uterus. In one case labor was delayed by a fibroid which presented before the child, and which was removed by incising the posterior vaginal wall and splitting the capsule of the tumor, the parts being afterward closed by stitches of catgut. An elastic bag was then

placed in the cervix and labor pains stimulated, when spontaneous birth followed.

In the induction of labor, when the os and cervix are sufficiently open, the bag forms the most efficient stimulus to dilatation and expulsion which we possess. In forty-five cases of induced labor in which this method was used the maternal mortality was nothing. In 20 per cent. slight fever occurred, followed by recovery. The mortality among the children was 17.7 per cent. In prolapse of the cord this method is especially valuable, as the bag prevents the cord from collapsing after replacement.

In cases where the amniotic liquid escapes prematurely the use of the bag is especially indicated. In some of these cases the pelvis is contracted, and most of them require operations for delivery. In thirty-six cases the mortality was nothing. Sixteen per cent. had slight fever. All made satisfactory recoveries. In eclampsia and hemorrhage occurring before the uterus is emptied the use of the elastic bag is among the most valuable of our resources. In four cases of eclampsia and eight of bleeding, occasioned by a low attachment of the placenta or partial separation, this method gave most satisfactory results.

[Rubeska's paper refers to Braun's bag, which is single, and usually of small size. The double bag of McLean we have found especially valuable, because its two halves give greater dilatation with but a single application.]

GYNECOLOGY.

UNDER THE CHARGE OF

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Latent Gonorrhœa Excited by Traumatism.—NIEBERGALL (Hegar's *Beiträge zur Geb. u. Gyn.*, Bd. ii., Heft 1) reports four cases which seem to prove that latent gonorrhœal infection may be stimulated by traumatism.

CASE I. A married woman, aged thirty-three, had been sterile for several years. The cervical canal was dilated with tents. The removal of the third was followed by a profuse discharge containing gonococci. The patient had severe abdominal pains, a chill, and a high temperature persisting for ten days. Pyosalpinx subsequently developed.

CASE II. The patient, aged twenty-one, had had gonorrhœa several years before, but was apparently cured, no gonococci having been present for some months. The canal was dilated with tents to cure sterility, when the same result occurred as in the former case.

In another instance gonococci appeared in the discharge after curettement for incomplete abortion, there being no history of previous infection.

Acute Diffuse Gonorrhœal Peritonitis.—CUSHING (*Johns Hopkins Hospital Reports*, May, 1899) reports two cases in which gonorrhœal infection

spread to the general peritoneum during menstruation and after childbirth. Although peritonitis from this cause is rare, the writer believes that the peritoneum is not immune to infection any more than other serous membranes. It may be explained by reference either to the unusual virulence of the gonorrhœal poison or to peculiar susceptibility of the peritoneum.

Surgical Operation for Hysteria.—SANDER (*Deutsche med. Wochenschrift*, 1899, No. 36) cites two cases of hysteria, in one of which operative cœliotomy was performed twice and in the other four times with negative results. In the first all the symptoms of intestinal obstruction were present, while in the second it was supposed each time that perforation had occurred.

The author emphasizes the importance of considering the general condition of the patient with local symptoms which are apparently grave. The pulse and temperature are not affected in hysterical subjects, and the attacks of pain are apt to be most severe when a physician is present. In case a cœliotomy is performed with negative results, the persistence of the same symptoms points to hysteria. These patients should be isolated and carefully watched.

Ruptured Ectopic Gestation Complicating Strangulated Hernia.—TIXIER (*Lyon Med.; Centralblatt für Gynäkologie*, 1900, No. 24) cites a case of strangulated hernia in which an operation was performed two days before the menstrual period. After the sac was opened and the gut replaced the patient suddenly collapsed. Hemorrhage from the intestine being suspected, median cœliotomy was done, and the abdomen was found to be filled with blood which came from a ruptured tubal pregnancy the size of a walnut. It was removed, but the patient succumbed on the second day.

Total Extirpation of the Septic Uterus.—ZIPPERIEN (*Inaug. Dis.; Centralblatt für Gynäkologie*, 1900, No. 24) describes two cases of Döderlein's. In the first severe septic symptoms, due to the retained placenta fragments, persisted after two curettements. The uterus was removed per vaginam with a successful result. In the second case a septic double uterus, containing multiple interstitial fibroids, was extirpated by abdominal section, the patient making a good recovery. The writer collected 74 cases of operations, with 36 recoveries and 38 deaths. He recommends the vaginal route except in complicated cases.

Combination of Cancer of the Ovary and Stomach.—TIBURTINS (*Inaug. Dis.; Centralblatt für Gynäkologie*, 1900, No. 26) adds two cases to the two already reported, the associated conditions being extremely rare. Careful study of his cases led him to conclude that the cancer was primary in the stomach and extended by metastasis to the peritoneum, glands, and both ovaries.

Solid Ovarian Tumors.—DARTIGNES (*Rev. de Gyn. et de Chir. Abdom.; Centralblatt für Gynäkologie*, 1900, No. 26) summarizes a paper on this subject as follows: 1. Solid ovarian tumors are usually malignant, fibromata being rare. 2. Their malignancy increases with the age of the patient, fibromata being most common in young women, sarcomata later in life, then cancer.

3. Heredity plays little part. 4. Double tumors are most apt to be malignant. 5. The neoplasm may retain the shape of the ovary, irregularities of the surface would suggest malignancy as well as marked vascularity. 6. Fibromata are usually smaller than sarcomata, and the latter, as a rule, exceed in size cancerous growths. 7. The larger the tumor, the smaller is usually the pedicle. 8. Fibromata are generally movable and are unaccompanied by ascites, while sarcomata are usually attended with effusion. 9. Fibromata have a firm, hard consistence, sarcomata being soft, and cancerous tumors hard but friable. 10. Cancer of the ovary is more prone to early metastasis than sarcoma, and also extends along the lymphatics.

Torsion of Ovarian Cysts during Pregnancy.—PETRITSCHKE (*Inaug. Dis.; Centralblatt für Gynäkologie*, 1900, No. 26) has collected thirty-two cases, including two of his own, in twenty-six of which torsion occurred during pregnancy. The cause of the accident was discoverable in only two. In his experience it does not take place with solid ovarian tumors. In only three was the diagnosis certainly made before operation.

Symptoms of Solid Ovarian Tumors.—DARTIGNES (*Centralblatt für Gynäkologie*, 1900, No. 26) presents a résumé of this subject as follows:

Fibroma. Symptoms may be entirely absent in the early stage, aside from occasional colicky pains and disturbances of menstruation. On examination, a smooth, hard, movable tumor, not larger than a mandarin, is felt in the cul-de-sac or at the side of the uterus. As it increases in size menorrhagia or metrorrhagia may be present. Later pressure symptoms and enlargement of the abdomen are noted, occasionally moderate ascites. The general health is rarely affected, and the tumor may exist for fifteen years. Incision of the pedicle is rare.

Sarcoma. There may be few symptoms in the early stage, though ascites may develop rapidly. Pain and disturbance of menstruation are more common than in the case of fibromata. The results of physical examinations are nearly the same in both, except that œdema of the lower limbs often accompanies sarcoma, and both ovaries may be affected. The growth of sarcoma may be slow (thirteen years in one case) or rapid; it is favored by pregnancy. Metastasis is indicated by ascites, œdema, enlarged abdomen, and rapid decline in health. The prognosis as regards recurrence after operation is better than in the case of cancer.

Cancer. The latent period is uncertain, and ascites is by no means a constant accompaniment. Pain is often absent at first; emaciation and general symptoms occur earlier than in the case of fibroma and sarcoma. There is no characteristic menstrual disturbance; pressure symptoms are gradual in their development.

Benign Peritoneal Infection.—AUCHE and CHAVAUNAZ (*Revue de Gyn. et de chir. Abdom.; Centralblatt für Gynäkologie*, 1900, No. 26) conducted a series of bacteriological examinations with the view of determining how often infection occurred in aseptic operations. Twenty cases were observed in which recovery followed abdominal section. In seventeen micro-organisms were found in the peritoneal cavity at the end of the operation, though not

in large numbers. Their growth is favored by the peritoneal fluid, hence is more active in cases in which there is considerable exudation. No general symptoms were noted, but simply local irritation. Animals inoculated with cultures were not seriously affected. The staphylococcus albus was most often found.

New Method of Repairing Vesicovaginal Fistula.—SPASSOKENKOZKY (*Centralblatt für Gynäkologie*, 1900, No. 25) describes the following method of procedure in a difficult case: Six sutures were passed through the vesical mucosa and subjacent connective tissue around the edge of the fistula. By making traction upon these the opening was inverted into the vagina, so that it was easy to split the edges with a scalpel without injuring the mucosa. A catheter was passed into the bladder, the ends of the sutures were threaded into its eye and drawn through the meatus, thus uniting the mucous edges and bringing them in apposition. The vaginal edges were then sutured in the usual manner, after which the provisional ligatures were withdrawn through the urethra. The catheter was not left in the bladder. Five cases treated by this method were entirely successful.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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AND

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Disease of Adjoining Sinuses Involving the Orbit.—G. C. HARLAN (Philadelphia) points out that in opening the frontal sinus the degree of permanent disfigurement that will be caused is an important consideration. The incision advocated by Jansen, along the edge of the orbit beneath the eyebrow, is practically invisible if immediate union is secured, but tamponing the cavity as he recommends prevents this. Probably in a large proportion of cases thorough curetting and more or less prolonged drainage and antiseptic irrigation will make it possible to dispense with the tampon.

Harlan decidedly prefers the upper inner angle of the orbit as the location for cutting through the bone, which is thinner in this position and more likely to be diseased. The sinus is easily opened in this way in the normal skull, and when distended by empyema it is still more accessible. Then, too, this method of operating enables one to reach the ethmoid cells, which are nearly always involved. When the supra orbital arch is attacked and the anterior wall of the sinus removed, as advocated by Kuhnt, a more or less disfiguring depression of the visible scar must necessarily result.

In one of his cases Harlan cut off the drainage-tube within the nose and sustained it at the upper end by a piece of silver wire passing through the external wound, the wire being held securely in position by a piece of plaster. This permitted the complete closure of the external wound except the minute opening for the wire, reducing to a minimum the disfigurement. Harlan suggests that it might be better to close the main opening entirely and pass the wire completely through the sound skin.—*Transactions of the American Ophthalmological Society*, 1900.

Headaches Apparently Ocular, but Really of Nasal Origin.—A. E. EWING and G. SLUDER (St. Louis) find that headaches attended with tenderness on pressure over the pulley of the superior oblique muscle and the surface immediately adjoining are due to conditions of the anterior ethmoidal cells. Even when the headache appears to be aggravated by eye-strain, relief is afforded only by establishing a free communication of these cells with the outer air. They suggest that the pain and tenderness are due to disturbance of the air-pressure within the sinuses. Absence of the ordinary symptoms of ethmoidal disease by no means excludes the closure of the affected passages by permanent thickenings or temporary swelling of the mucous membrane.—*Trans. of the Amer. Ophthalmol. Soc.*, 1900.

Treatment of Retinal Thrombosis.—GALEZOWSKI (Paris) recommends the alternating application of hot and cold compresses. The changes from hot to cold and cold to hot are to be made every fifteen minutes. He employs a bag of very thin rubber, the mouth of which is closed with a clamp, which is filled alternately with hot and cold water. It is held in position by a band passing around the head. These applications continued for an hour, morning and evening, render the circulation more active, and thus improve the conditions of a diseased eye.—*Recueil d'Ophthalmologie*, June, 1900.

Retraction Movements of the Eyeball.—J. WOLFF (New York) reports five cases in which, along with other congenital defects in the external ocular muscles, the contraction of one or more of these muscles caused the eye to be drawn back into the orbit. In the first case there was divergent strabismus, and every attempt to turn the right eye inward caused it to be drawn back into the orbit fully 8 mm., quite away from contact with the margins of the lids. Under cocaine the attempt was made to rotate the eyeball with forceps, but it was found fixed at the outer side. In the second case the retraction amounted to 3 or 4 mm. and occurred on attempting to rotate the eye downward. In the other three cases, two sisters and a brother, the retraction was associated with rotation inward.

A. N. ALLING (New Haven) reports a case in which the affected eye could turn in only about twenty-five degrees, and this was accompanied by a retraction of about 10 mm.

H. KNAPP (New York) also reports a case in which with adduction the eyeball was drawn back and a little downward.—*Archives of Ophthalmology*, May, 1900.

[Seven cases of this condition have been previously reported, making the total now fourteen, yet it is probably not very rare, cases being sometimes

overlooked and sometimes not reported because the observer has found such a case only a puzzle. Tuerk, who reported three of the cases, offered two explanations of them which are probably sufficient to account for two principal classes of such cases. One explanation is, that one or more of the muscles are attached to the eyeball too far back, so that instead of rotating the eyeball they tended to retract it. Knapp, doing a tenotomy in his case, found something of the kind; and discussing Maclehorse's case, shown before the British Ophthalmological Society, Holmes Spicer reported a similar condition of the muscles. The other explanation supposes that one of the muscles is replaced by unyielding tissue which will not permit the normal rotation of the globe, so that the opposing muscles come to pull the eye backward. Alling, making an exploratory incision over the external rectus in his case, found nothing but tendinous tissue, which gave a special sense of resistance on attempting to rotate the eye inward. We believe with Wolff that surgical interference will benefit some of these cases. In fact, both Alling and Knapp report a satisfactory cosmetic result, although the movements of the eyes in certain directions remained extremely limited.—ED.]

Hysterical Amblyopia.—H. PARINAUD (Paris) classes under this general head the ocular manifestations of hysteria other than disturbances of the motor apparatus. He includes thus concentric contraction of the visual field, which may be of any degree, and may be variable and constant, and may affect either the form or color-field, or both. The inversion of the order blue, red, green of the boundaries of the color-fields, he considers a symptom of some importance. In rare cases he has observed central scotoma. Monocular polyopia is commonly accompanied by amblyopia, and in most cases by spasm of accommodation. He ascribes it to an actual multiplication of the retinal images, due to the lack of correspondence in the refraction of the different segments of the crystalline lens.

Hysterical amaurosis is marked by preservation of the pupillary reflex. Although the blindness may be complete when one eye is used alone, it can be conclusively demonstrated that the patient has binocular vision when attempting to see with both eyes open. The amblyopia is very closely related to other forms of hysterical anæsthesia. Hysterical amblyopia is usually bilateral, but may be strictly monocular. Hysterical hemianopsia is never permanent, but rather has the character of ophthalmic migraine or scintillating scotoma.—*Annales d'Oculistique*, July, 1900.

Filling of Collapsed Eyeballs with Salt Solution.—G. E. DE SCHWEINITZ (Philadelphia) reports a case in which, the lens and a large part of the vitreous having been expelled by the patient suddenly squeezing the lids, the collapsed eyeball was filled with warm sterile physiological salt solution. This caused perfect coaptation of the wound, and was followed by normal healing and a good visual result.

De Schweinitz agrees with Knapp that the chief value of this procedure lies in its preventing the sucking in of infectious material from the conjunctival sac, and also in preventing detachment of the retina.—*Ophthalmic Record*, August, 1900.

[This use of physiological salt solution was first resorted to by Andrews some years ago, but has recently been urged as an important proceeding by Knapp. It is applicable to some cases of severe injury of the eyeball as well as for collapsed globes following cataract extraction.—ED.]

OTOLOGY.

UNDER THE CHARGE OF

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Bacteriology of Acute Otitis Media.—E. LEUTERT (*Archiv. für Ohrenh.*, July and September, 1899) considers this subject under three heads: (a) Acute primary inflammation of the middle ear; (b) Acute secondary inflammation of the middle ear; and (c) Complications in the mastoid region, including sinus thrombosis. He states that it has been shown by the investigations of Löwenberg, Fränkel, Simmonds, Zaufal and many others that genuine primary acute median otitides may be excited by the following germs: 1, the pneumococcus of Fränkel; 2, the streptococcus pyogenes; 3, the pyogenous staphylococci; 4, pneumobacillus of Friedländer; 5, the bacillus pyocyaneus; 6, the meningococcus intracellularis of Weichselbaum-Jaeger, as in cases described the aural suppuration was the primary disease from which the cerebro-spinal meningitis originated; 7, the actinomyces. The chief producers, however, of primary acute otitides are the pneumococcus of Fränkel, the streptococci, and staphylococci. The other germs occur only exceptionally.

Secondary (Acute) Otitides.—LEUTERT states that the observations of Marie Raskin and of Blaxall have shown that in scarlatinous otitis media the streptococci are the chief causative factors. The causative factor in the otitis of measles has not yet been definitely made out. The primary factor in diphtheria-otitis is still not clearly demonstrated. In influenza otitis, pneumococci and then streptococci seem to be the causative agents. The otitides of typhoid fever are not caused by any special germs. They occur in the later stages of the disease when the weakened body of the patient is a ready prey to various germs. From an observation of Krøning's (*Centralblatt f. Gynäkol.*, 1893) it is admitted by Leutert that the gonococcus can excite a primary suppuration in the middle ear.

Complications. There are few special bacteriological investigations of the cause of aural complications or mastoid empyema. As far as these have been conducted it may be concluded that pneumococci and streptococci possess nearly an equal ability to set up an acute empyema of the mastoid. The few bacteriological investigations in pyæmia of otitic origin tend to show that the streptococcus is the efficient agent.

Otitis Neonatorum and Catarrhal Diseases of the Middle Ear in General.—LEUTERT thinks that though the pathogenic germs of otitis neo-

natorum cannot be clearly demonstrated, this disease is probably "a supuration excited by the entrance of amniotic fluid and its ingredients into the drum-cavity during parturition," as first claimed by Aschoff (*Zeitschr. f. Ohrenh.*, 1897). In acute catarrhal inflammation of the middle ear it seems that streptococci and pneumococci play the prominent part, while in chronic purulent catarrhs the staphylococci are the chief pathogenic factors.

In Leutert's account of his own bacteriological investigations in acute and chronic purulent otitis media, his first statement of practical importance is that the hearing is less reduced in cases of pneumococcic infection of the middle ear than in cases of streptococcic infection of that organ.

The results of Leutert's investigations are summed up as follows:

1. In 63 cases of mastoid empyema after *acute* aural suppuration, the streptococcus alone was found upon culture 38 times, with impurities 1, and in conjunction with a bacillus 1. The pneumococcus was found pure in culture 11 times, and twice with some uncertainty. The staphylococcus albus pure 5 times, with pneumococci, perhaps, in 1 case. Tuberculosis pure in 2 cases, and once with others not closely determined micro-organisms. In 1 case the cultures remained sterile.

2. In 10 cases of epidural abscess following acute purulent otitis media, the streptococcus was obtained pure in 2 cases, the pneumococcus pure 6 times, and in 1 case with uncertainty, as the guinea-pig used for control experiment did not react. The staphylococcus albus pure in 1 case.

Syringing of the Ear.—Conservative use of the syringe in purulent otitis media is well shown in an article by W. A. GOLDSTEIN (*New York Medical Journal*, July 29, 1899). [A good guide to follow in this matter is never use a syringe if mopping with cotton will cleanse an ear.]

So-called Otitis Media Neonatorum.—L. ASCHOFF (*Arch. of Otol.*, August, 1899) after a series of pathological studies concluded: (1) That "in the tympanic cavity of the new-born child, so long as complete displacement of the fluid by air has not taken place during extra-uterine life, fluid is found present, varying in appearance from clear fluid to a tenacious mucoid pus plug."

2. Pus formation in the tympanum is not a physiological occurrence, not the prerequisite of the formation of a tympanic cavity, as it is not found in all cases. It must be considered the consequence of a contamination of the tympanic cavity by amniotic fluid.

3. The mucous membrane of the tympanum shows in the new-born child a cellular infiltration corresponding in degree with the intensity of irritation, caused by the elements of the amniotic fluid, but it never reaches the same degree of irritation as is seen in bacterial otitis media.

4. The occurrence of gross particles of vernix and meconium in the tympanum of the new-born child is due to intra-uterine respiratory movements.

5. The retrogression of the foetal mucoid tissue is an intra-uterine occurrence, following laws of growth still unknown, and not in consequence of mechanical influences as Wreden, Wendt, and others infer. The size of the cavum tympani does not allow a determination as to whether respiration has occurred before or after birth.

6. The finding of particles of vernix and meconium in the tympanum would suggest intra-uterine respiration, and therefore it may have some medico-legal value. A concluding assertion of Aschoff is that there is no such thing as a "true bacterial otitis media neonatorum."

Chronic Suppurations of the Middle Ear.—E. LEUTERT (*Archiv. f. Ohrenh.*, July, September, 1899) maintains that the investigations of Levy and Schrader, Gradenigo and Pes, Kanthack, Maggiora, Martha and Stern, show three distinct differences between the bacteriological conditions in chronic suppuration of the middle ear and those of acute suppuration of the same cavity, viz.: First, the very frequent occurrence of septic bacteria in the former, and the very rare occurrence of these bodies in genuine acute otitis media; second, the very frequent and, according to some observers, constant occurrence of staphylococci in chronic purulent otitis media; and third, the absence of pneumococci in the latter disease. Stern claims to have found in one case of chronic purulent otitis media the bacterium coli. But Leutert seems to doubt the reliability of the culture in this instance.

Leutert has found in 2 cases of periauricular abscess, without demonstrable affection of the mastoid, the streptococcus pure, and the staphylococcus albus pure in one case.

In 5 mastoid empyemata occurring after chronic suppuration of the middle ear the staphylococcus albus was found pure in one case, with the bacilli of pseudodiphtheria in one case, with bacilli of uncertain nature in two cases, and with streptococci in one case.

In 2 cases of epidural abscess occurring in connection with chronic suppuration in the ear, the staphylococcus albus and a bacillus were found in one case, and the staphylococcus albus in company with a bacillus and streptococci in one case.

In 4 cases of sinus thrombosis with acute empyema of the mastoid, the streptococcus, pure, was found in 3 cases, and with the staphylococcus pyogenes aureus, with a bacillus, in 1 case.

In two cases of mastoid empyema after chronic suppuration of the ear, with sinus thrombosis, the staphylococcus albus, with the bacterium coli commune, was found in one case, and once in company with a bacillus.

In seven cases of brain abscess of otitic origin, the streptococcus pure was found in one case; with a bacillus, in one case; with a bacillus and the staphylococcus albus, in one case; with the staphylococcus albus and proteus vulgaris, in one case; in one case of brain abscess a bacillus apparently pure by culture, and later in this case staphylococci were found by the microscope; in one case the bacterium coli were found pure; and in one case the proteus vulgaris pure.

So far as concerns prompter cessation of middle-ear suppuration, less destruction discovered by operation, lower temperatures and shorter after-treatment, Leutert agrees with Netter and Zaufal that the pneumococcus is the most benignant of all the excitants of middle-ear suppuration. Leutert claims to have shown in eight cases out of ten of epidural otitic abscess that the pneumococcus was the causative organism. He agrees with Vetter that otitic sinus thrombosis is caused almost exclusively by streptococci. Scarlatinous otitis seems to be also entirely produced by streptococci. Leutert

holds that this adds fresh proof that the pathogenic factor giving virulence to scarlatina is the streptococcus, while the supposed specific scarlatinous germ bears no relation to the severe general infections and suppurations appearing in the disease. In general he concludes that all secondary otitides are produced by the streptococcus. He also agrees with those investigators who maintain that the chronicity of aural suppuration is due to secondary infection by staphylococci.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Industrial Dangers: Lead Poisoning. During a single year of hospital service thirty cases of lead poisoning among workmen engaged in making and charging storage batteries were seen by DR. TALAMON (*La Médecine Moderne*, February 7, 1900). From the nature of the work the symptoms come on more rapidly and are more acute than with painters, typesetters, and others prone to the affliction. Their work consists chiefly in spreading with their palms minium ("red lead") and litharge over lead plates. They are required to wash the hands with soap, lye and acidulated water every half-hour, but the water is not frequently renewed. Many of the men fall victims to acute lead colic within three or four weeks from beginning work.

Potassium Bichromate Poisoning. In the manufacture of Swedish safety matches a mixture containing potassium chlorate and bichromate is employed; each match-head contains about a half milligramme of the latter salt. The work-people are exposed to this agent in four different operations, including the boxing of the finished product. The women who do this part of the work in the factories in Pomerania have presented for some years cases of more or less severe eczema, with headache and prostration, which were at first attributed to the use of impure paraffin. One of these women was discovered by WODTKE (*Vierteljahrschrift für gerichtliche Medicin, etc.*, 3d series, xviii., p. 325) to have a perforated septum, a condition very general among the workmen in bichromate factories. Examination of the women engaged in two establishments disclosed fifteen cases of perforation or ulceration of the septum among 126 individuals. In a third factory he found a case of very extensive perforation in a man who prepared the dipping mixture. In only one case was general poisoning observed.

Arsenic Poisoning Among Aeronauts. A number of cases of icterus were observed by MALJEAN (*Archives de Médecine Militaire*, February, 1900, p. 82) among the balloonists of a regiment of engineers. The cause appeared at first obscure, but was traced by him to the hydrogen gas used for filling the

balloons. This is made by the action of ordinary sulphuric acid on commercial zinc, both of which contain arsenic in variable amounts, and so the product contains arseniuretted hydrogen. The impure gas is liberated from the valve of the balloon, but this is not the sole source of the danger, for the officers and men have a habit of smelling of the stopcock during the operation of filling, in order to ascertain when the air in the tubes has been expelled by the gas. The onset is marked by great malaise, headache, nausea, stiffness of the joints, jaundice and hæmoglobinuria. The symptoms subside in a few days, leaving the patient in a very bad condition of anæmia and pronounced malnutrition. The obvious remedy for the trouble is the employment of better materials or the avoidance of sniffing of the stopcock.

Vanilla Poisoning. A number of women engaged in work at a factory in Geneva where vanilla beans are treated for the market have been found to be afflicted with a severe eruption on the hands, forearms, neck and face, accompanied by burning and œdema, and at times furunculosis and moderate pruritus. The menses were more abundant or more frequent. Similar cases have been very common among the women employed at Bordeaux in an establishment where between 20,000 and 30,000 kilos of vanilla beans are assorted, brushed and bundled annually; but here some additional symptoms have been recorded, including headache, vertigo, insomnia, muscular pain, and irritation of the bladder and vagina. Whether the trouble is due to the minute crystalline needles of vanillin which cover the bean, or to moulds and mites, or to cardol in the oil of the cashew nut, said to be used on vanilla beans for the conferring of an improved appearance, has not yet been satisfactorily determined, but each of the theories has firm adherents.

Brass Poisoning. Workers in brass are subject, according to W. MURRAY (*British Medical Journal*, June 2, 1900, p. 1334), to a form of chronic poisoning which first takes the form of anæmia, with rapid heart action, nausea and vomiting, thirst and abdominal pain. This condition is succeeded by progressive emaciation and weakness, headache and neuralgias, disordered digestion, sweating, respiratory disturbances, and annoying eruptions of the skin. A green line on the gums is commonly present in workmen of this class, whether poisoned or not. To which of the constituents of the brass the disturbance is due is not known, but Murray is inclined to the belief that it is the copper that is to blame. Potassium iodide was administered without result, but phosphorus in one-thirteenth-grain doses proved beneficial. Phosphorus was suggested by the fact that in poisoning by that substance, copper sulphate is given as an antidote. Still better results were observed after the administration of dilute phosphoric acid. By way of prophylaxis he recommends free ventilation, personal cleanliness, avoidance of eating in the work-rooms, and the use of phosphoric acid in small doses in the drinking water.

[These symptoms are in many particulars similar to those of "brass-founder's ague," for which milk is a favorite prophylactic. The use of phosphorus as an antidote cannot properly be based on the reverse application of copper sulphate, for in the latter case a reaction occurs which would not be brought about by the alloy; nor if theoretically this agent is a proper one could the use of the acid be justified by the same reasoning, since the action of the two substances in the animal economy has nothing in common.—C. H.]

Influence of Extreme Cold on Bacteria.—Following their experiments, which demonstrated that exposure of bacteria for twenty hours to the extreme cold of liquid air was without appreciable influence on the vital properties of the organisms, MacFAYDEN and ROWLAND (*Lancet*, April 21, 1900) have made a new test in which the period of exposure was seven days. Broth cultures of *B. typhosa*, *B. coli communis*, *B. diphtheria*, *B. proteus vulgaris*, *B. acidilactici*, *Sp. cholerae Asiatica*, *St. pyogenes aureus*, *B. anthracis sporulans*, and *B. phosphorescens*, and a sarcina, a saccharomyces, and some unsterilized milk were sealed in fine quills and kept at -190°C . for seven days, after a preliminary cooling by means of solidified carbon dioxide. At the expiration of the time mentioned the quills were withdrawn and allowed to thaw. In no case was vitality impaired, the milk became curdled, and the pathogenic bacteria grew and emitted light.

[Their first experiments were reported in the *Lancet* of March 24 of the current year. Ravenel (*Medical News*, June 10, 1899) had already shown that short exposures, thirty minutes to three hours, were without effect on four different species.—C. H.]

Pathogens in In-door Air.—The air of all manner of confined spaces, from the homes of the wealthy to the lowest kinds of cheap lodging-houses, and including public carriages, railroad cars, etc., has been the subject of investigation by E. CONCOROTTI (*Centralblatt für Bakteriologie, etc.*, xxvi. p. 492), who exposed Petri plates of glycerin-agar in these places for varying periods of time and then incubated them for twenty four-hours. They were then treated with sterile distilled water which subsequently was injected intravenously into rabbits. Out of forty-six animals, fourteen were unaffected. Of the thirty-two which were affected, nearly half, fifteen, showed *Staphylococcus pyogenes aureus* in the organs, and eight showed *S. pyog. albus*. The third organism in frequency was the colon bacillus, which was found in the organs six times, once associated with *S. pyog. aureus*. Two animals died of infection by Fraenkel's diplococcus, one by *B. pyogenes foetidus*, and one by a bacillus like that of typhoid fever. Death occurred in all cases in from one to ten days after the operation.

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Dr. J. W. Mallet, *Professor of Chemistry, University of Virginia:* Extract from report of analysis of *Calculi* discharged by patients under the action of **BUFFALO LITHIA WATER**, Spring No. 2.

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